

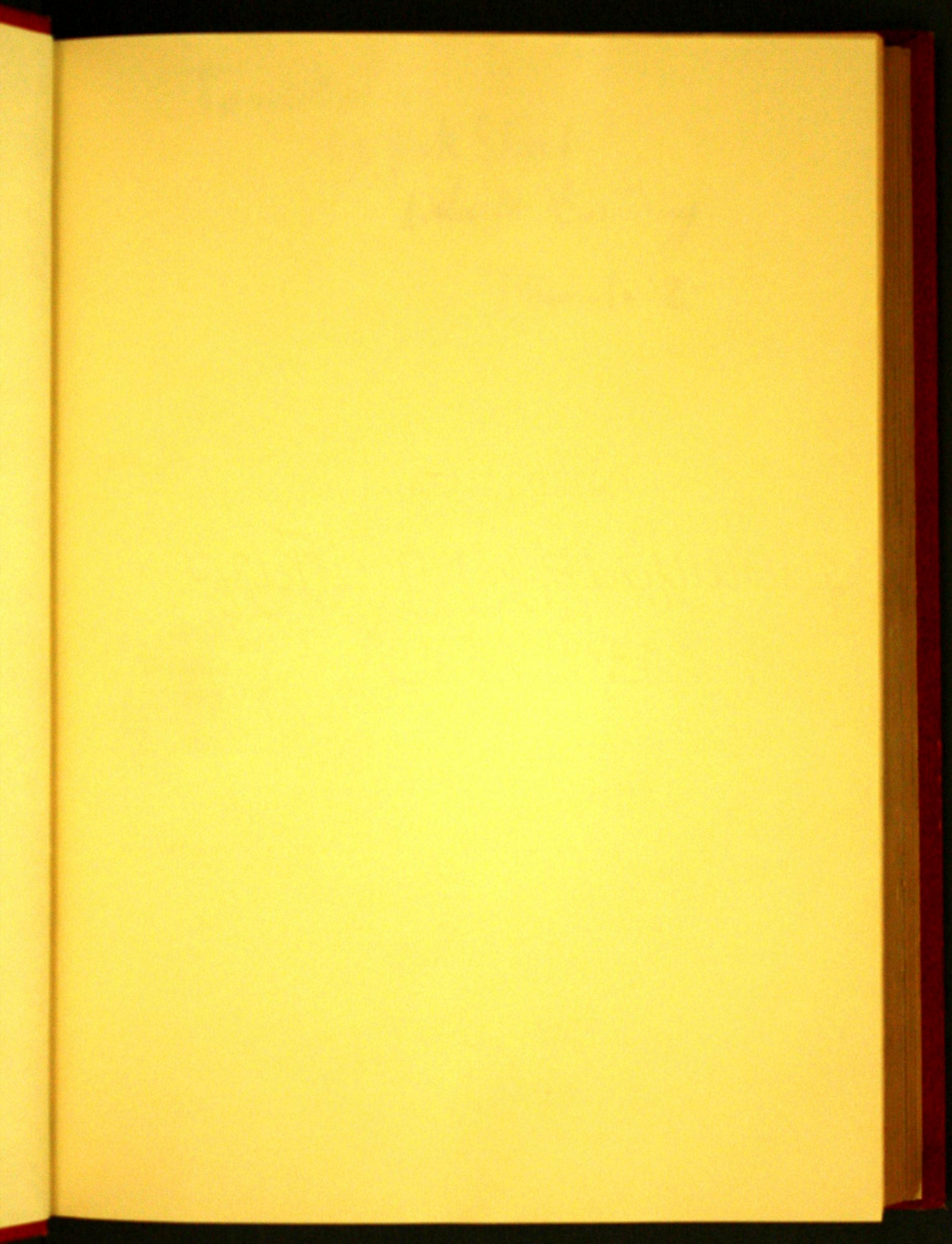
CHEMICAL *and* BACTERIOLOGICAL LABORATORY APPARATUS



CATALOG "C"

CENTRAL SCIENTIFIC CO.

CHICAGO, U. S. A.



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Lewis Bonigoy

LABORATORY APPARATUS

FOR

CHEMICAL, INDUSTRIAL, METALLURGICAL,
BACTERIOLOGICAL, BIOLOGICAL, BOARD
OF HEALTH, HOSPITAL AND SOIL TESTING
LABORATORIES

CATALOG C

No. 222

□

Established
1889

A. H. McCONNELL, President.
H. C. ARMS, Vice-President.
J. M. ROBERTS, Secretary.

Incorporated
1900

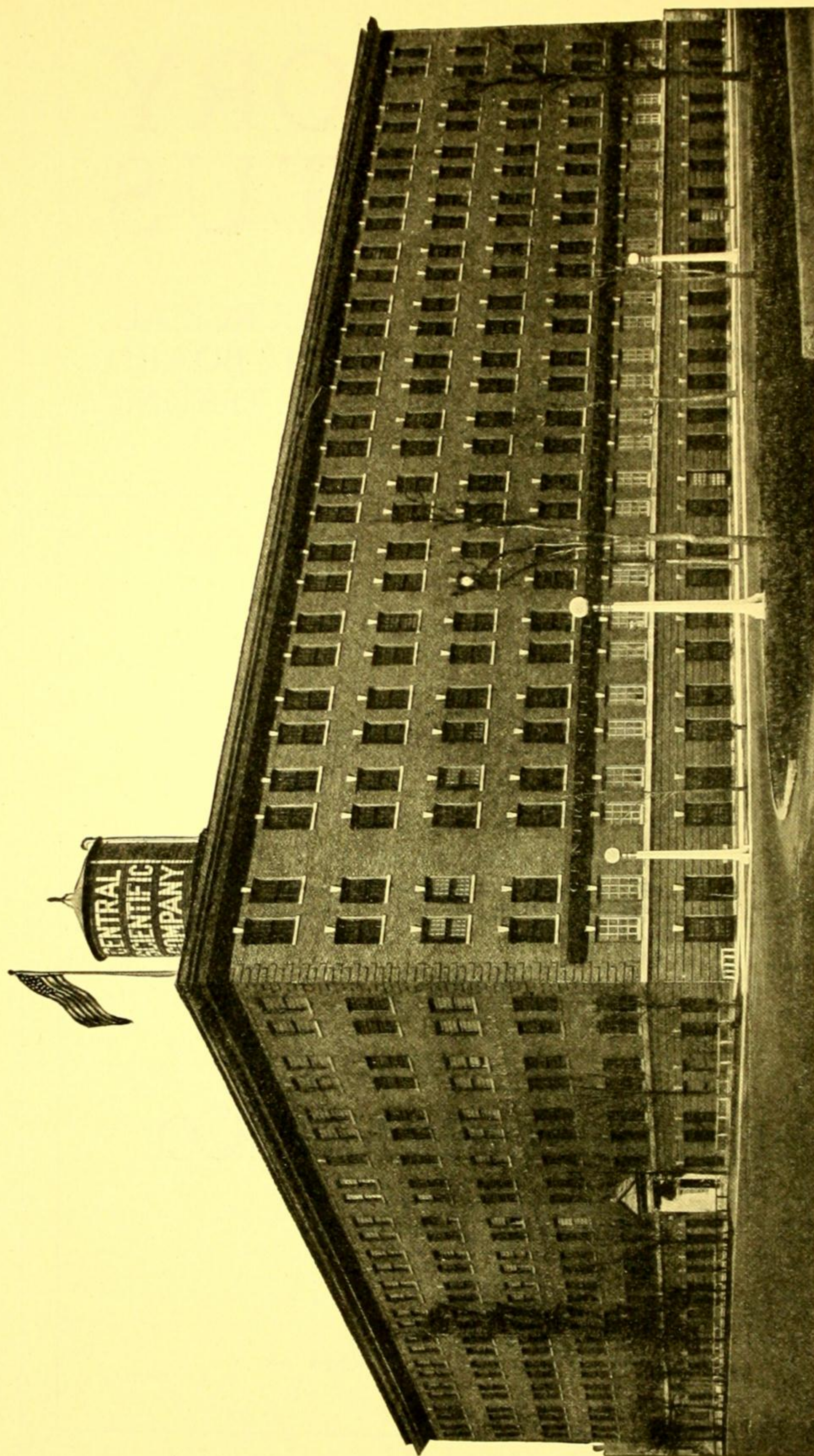
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CENTRAL SCIENTIFIC CO.

460 East Ohio Street
(Lake Shore Drive, Ohio and Ontario Streets)

CHICAGO
U. S. A.

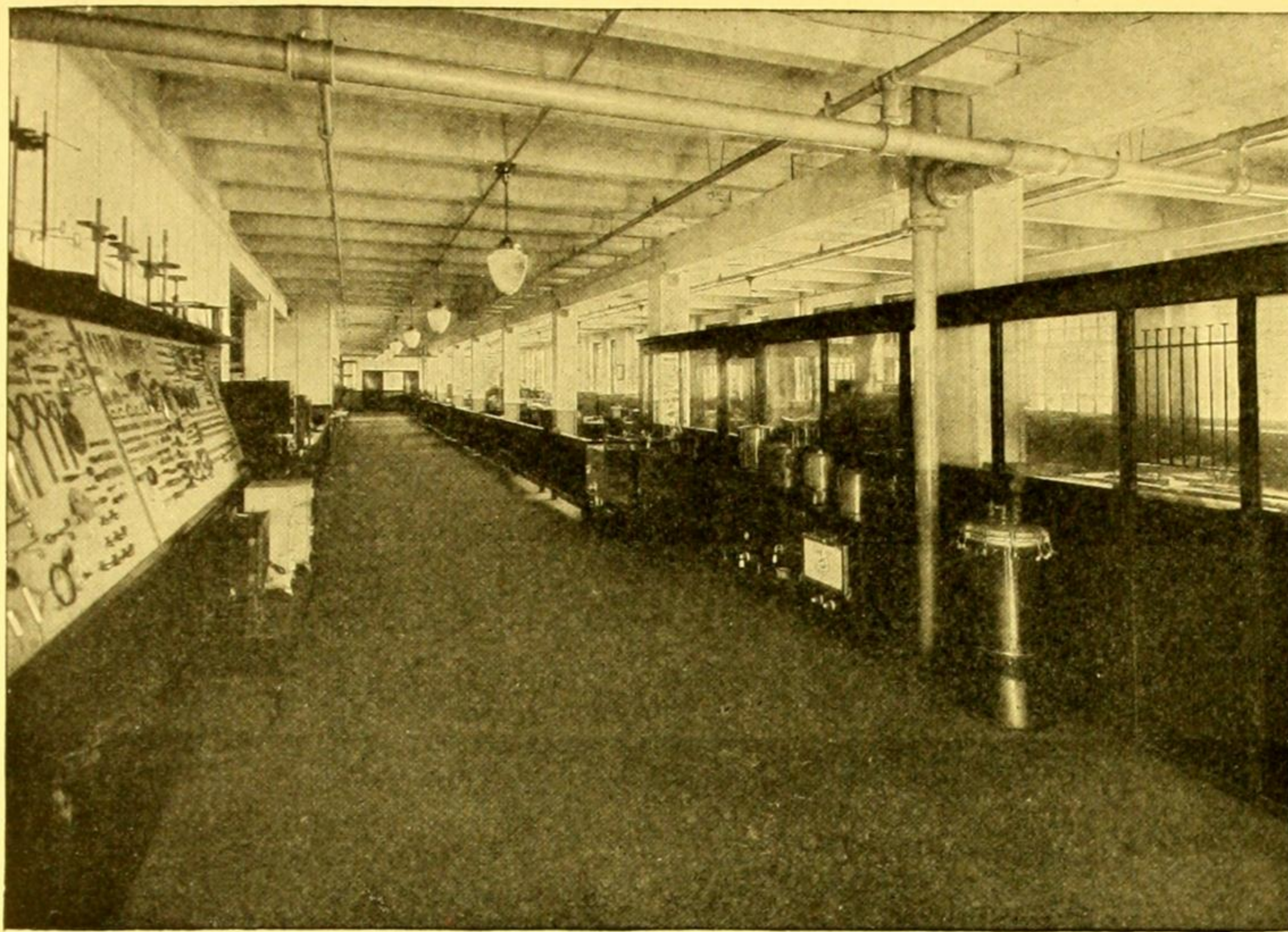
Cable Address—CENCO.
CODES: Western Union and A.B.C., 5th Edition.



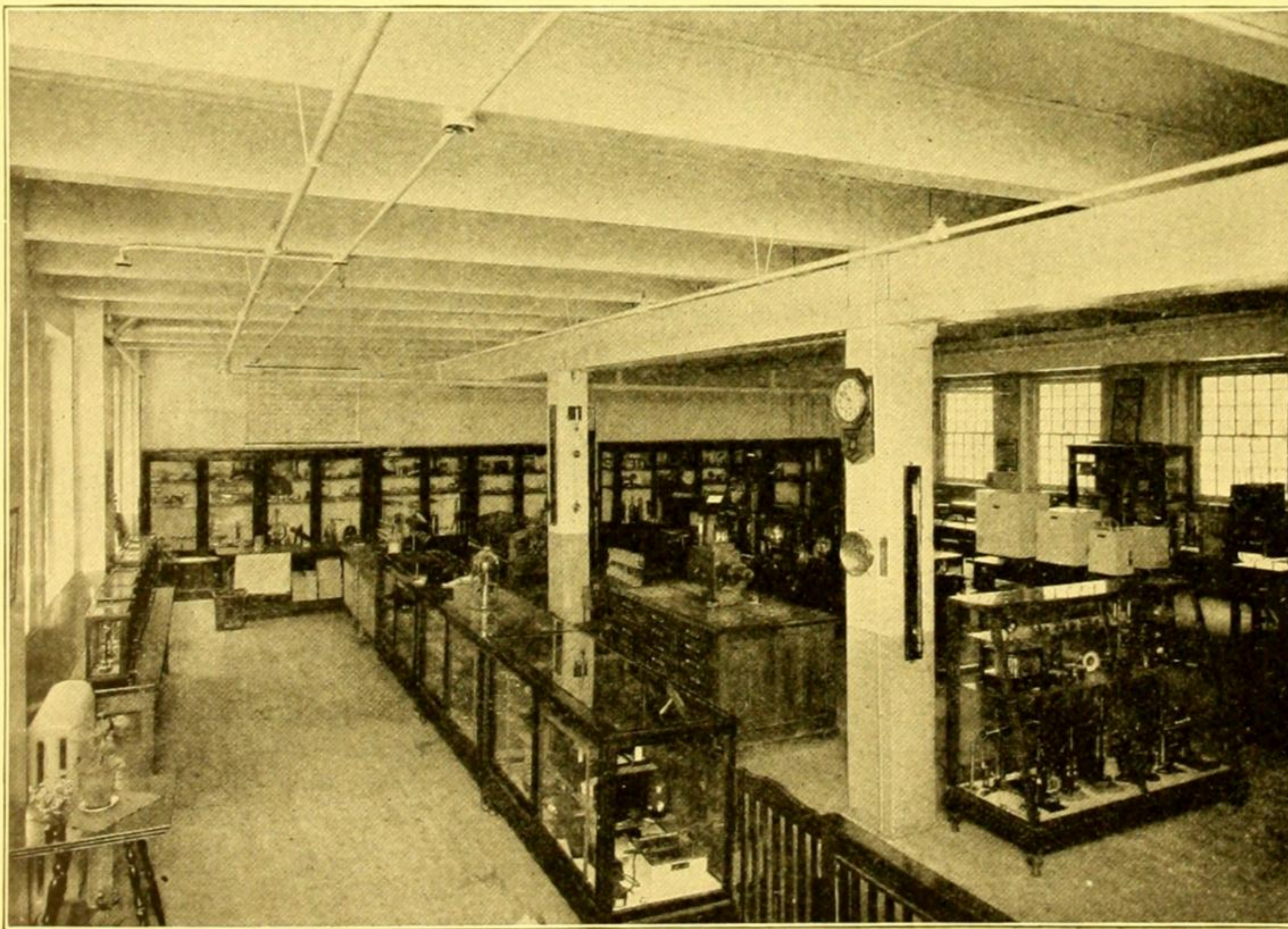
THE HOUSE OF CENCO.

We are located on Chicago's famous Lake Shore Drive, extending from Ohio to Ontario Street, in a well-lighted, modern, up-to-date six story building admirably adapted to our needs. Its 146,000 square feet of floor space afford us ample room for our manufacturing facilities as well as for our large and complete stock of scientific equipment. A complete showroom is maintained for the convenience of our customers.

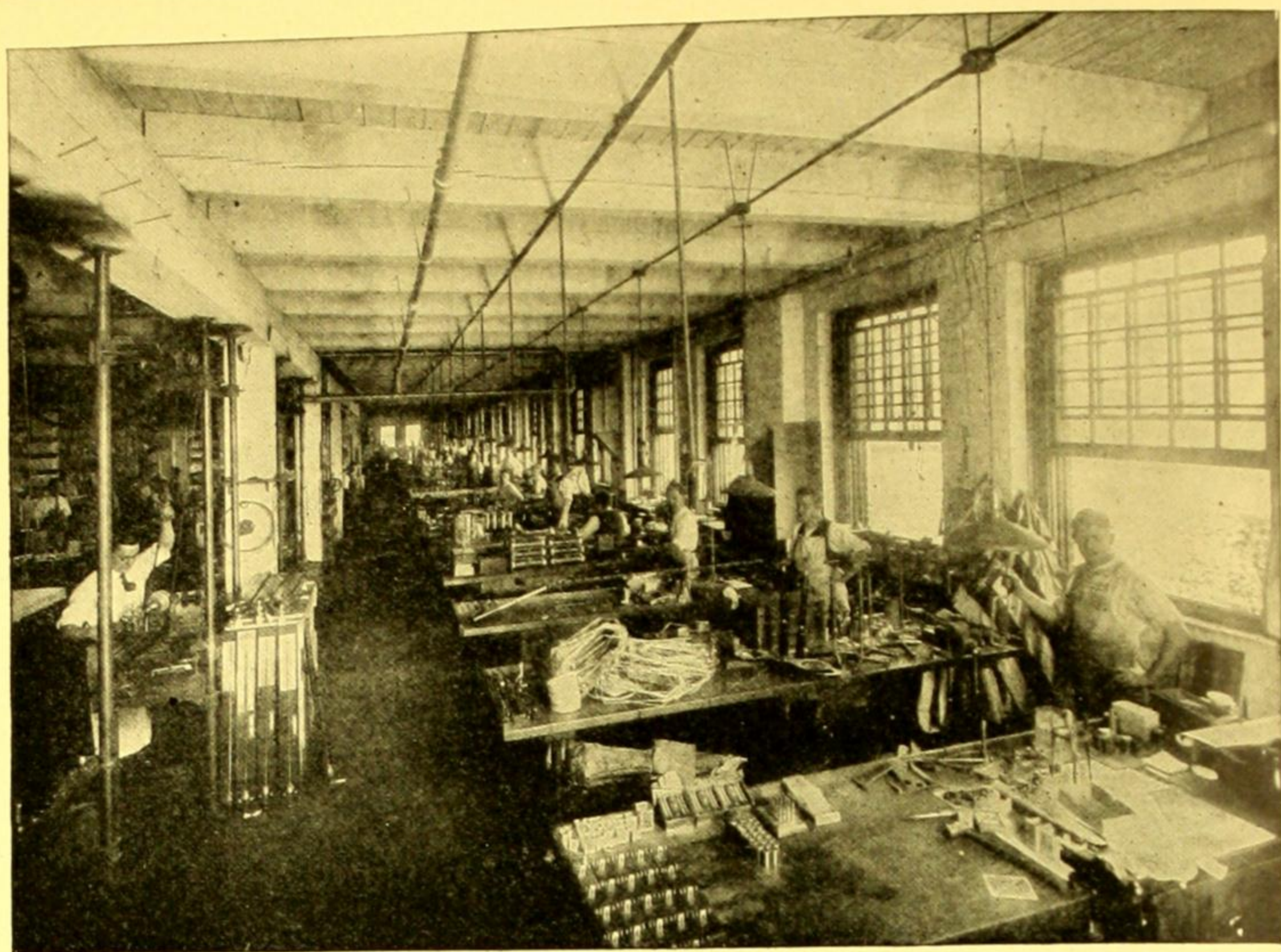
COME AND VISIT US WHEN IN THE CITY.



The Central Corridor of Our Spacious and Well Lighted Offices.



One of Our Display Rooms.



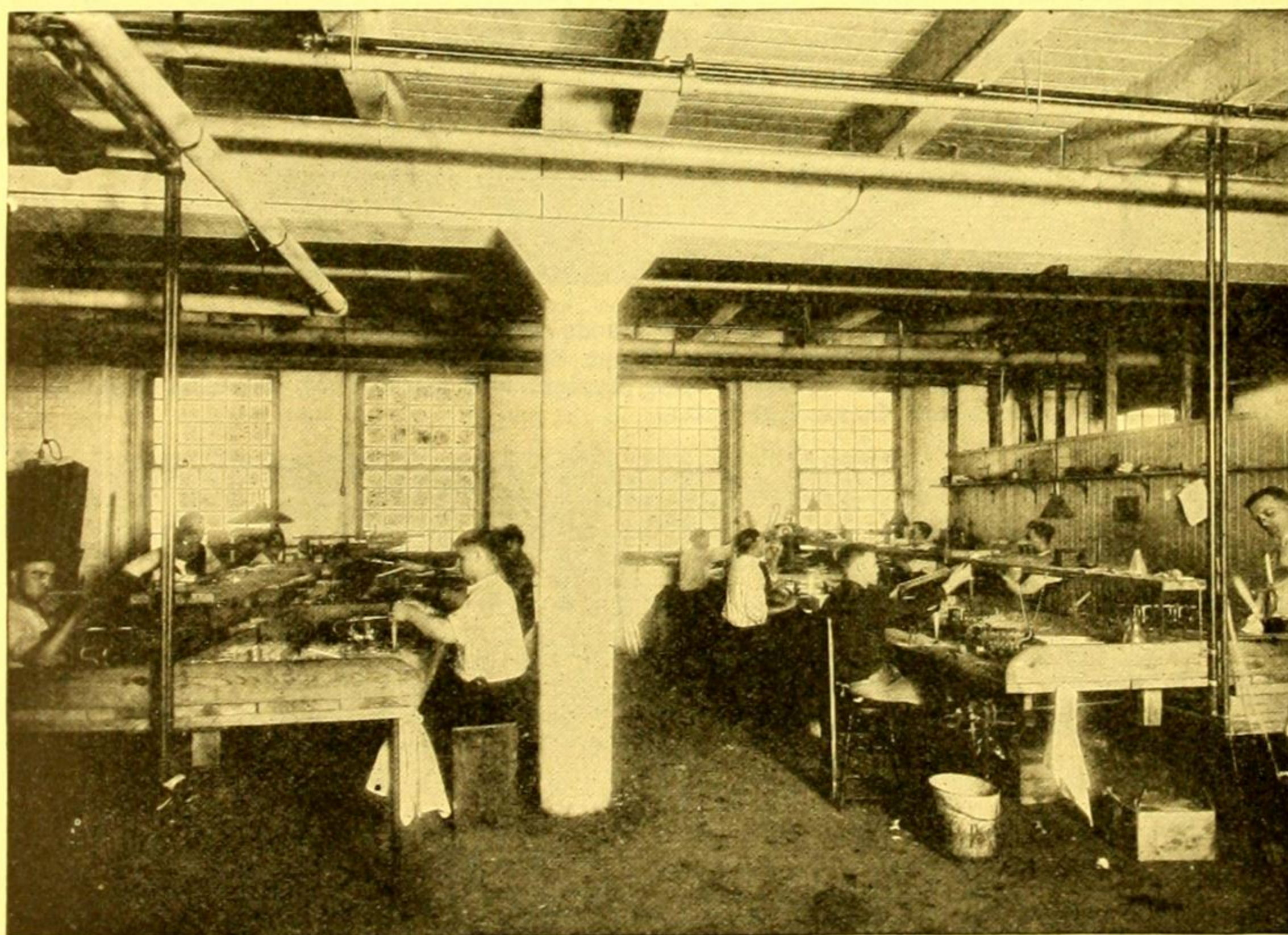
Looking Down the Central Aisle of Our Instrument Shop.



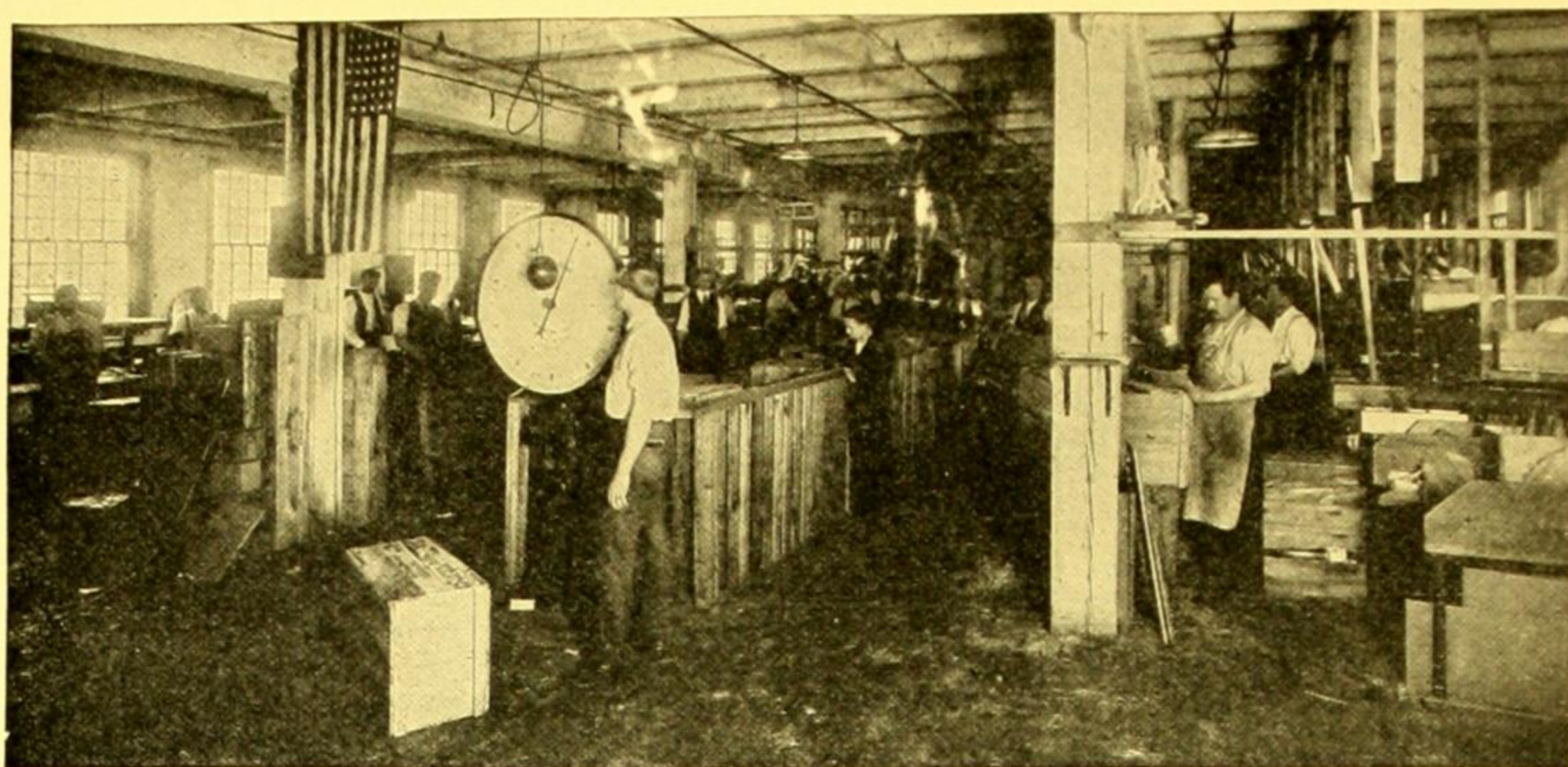
Our Heavy Duty Machinery Room.



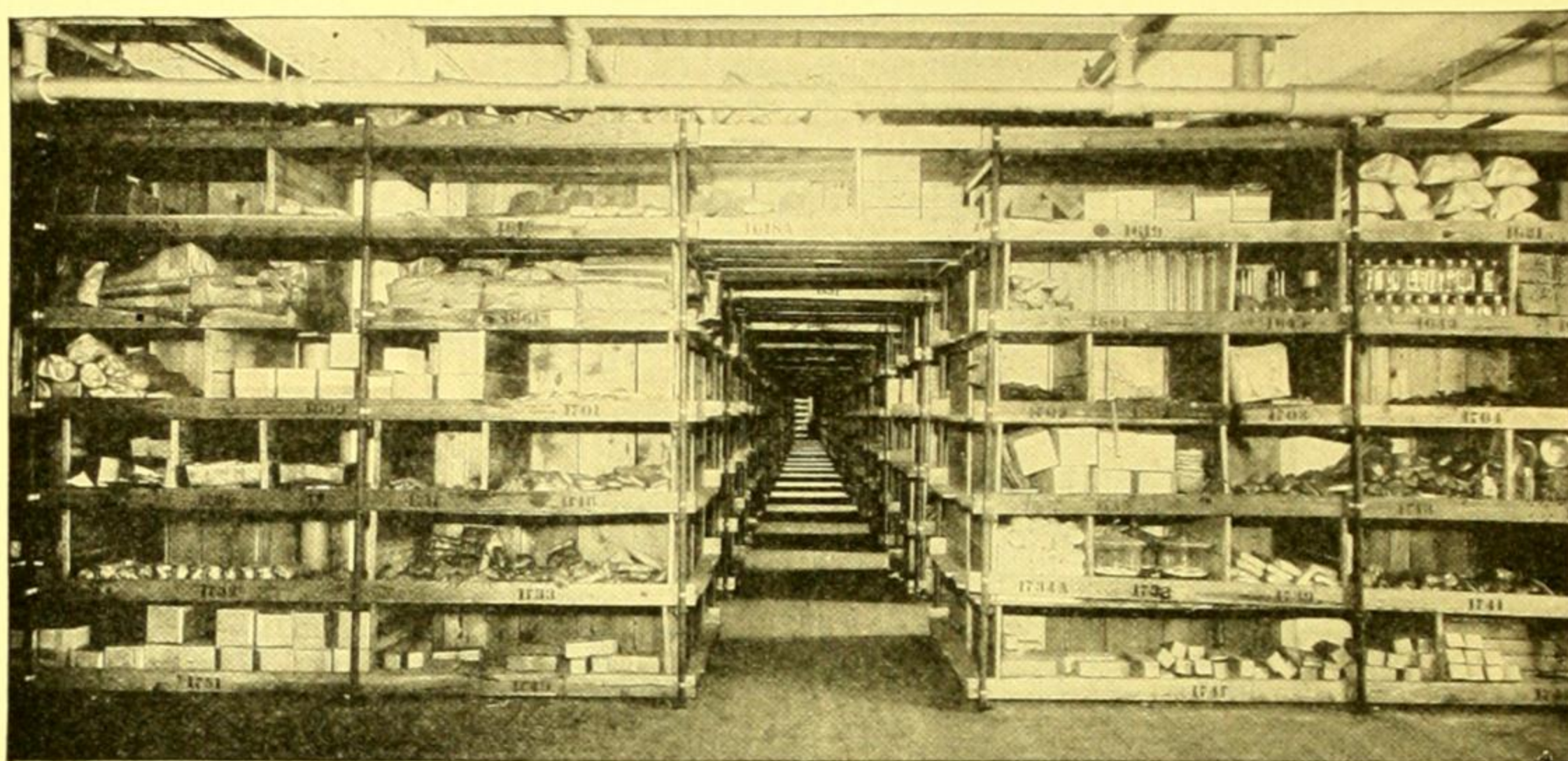
One of Our Chemical Stock Rooms.



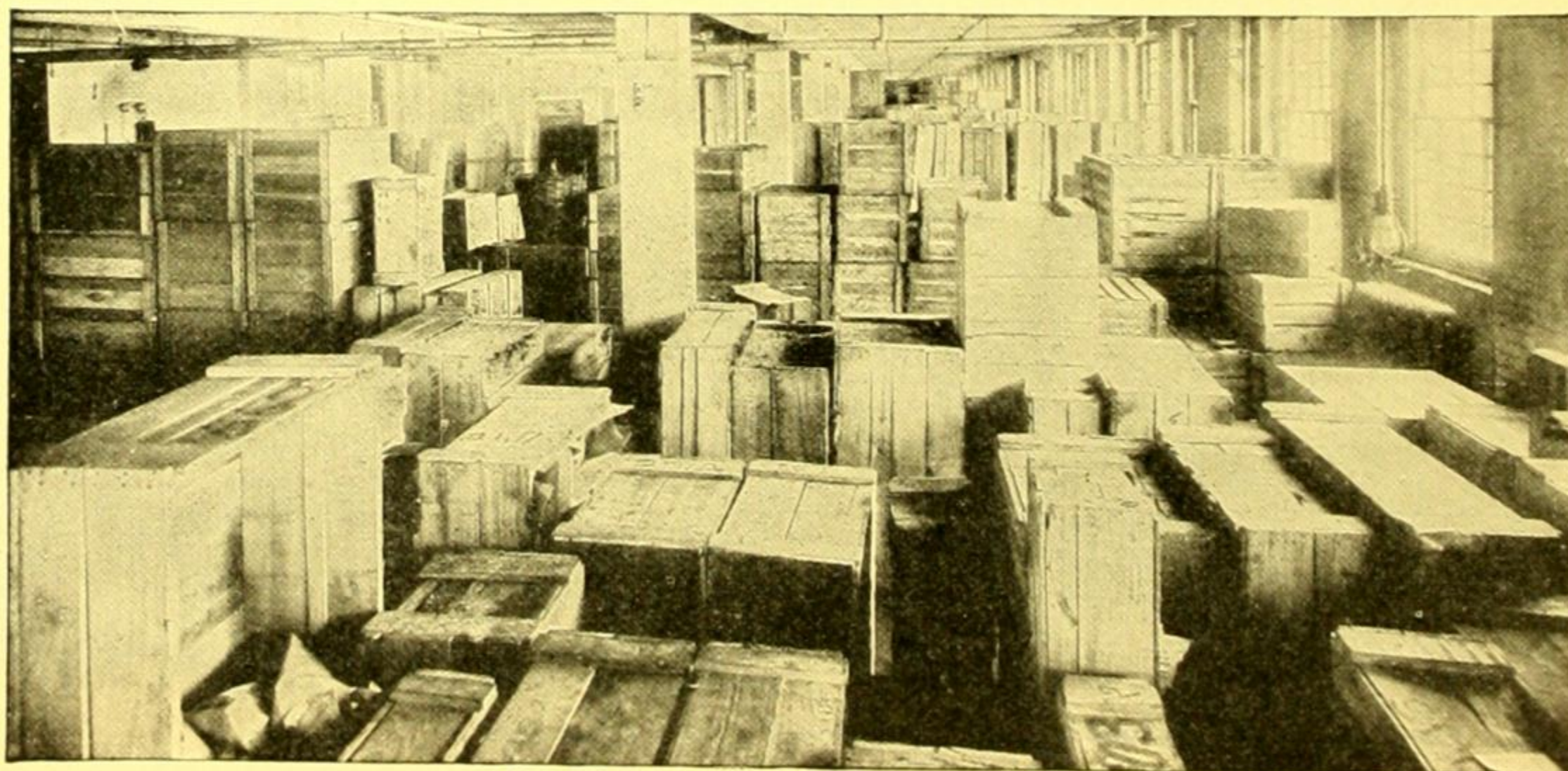
One Corner of Our Glass Shop, which Includes in Addition to the Lamp Room (shown here) a Graduating and Grinding Room, an Acid Room, an Annealing Furnace, a Stock and Preparation Room and a Business Office.



A View of Our Shipping Room.



One Section of Stock Bins Showing How Goods are Stored When Taken Out of the Original Cases. Over 40,000 Square Feet of Floor Space are Occupied by Our Stock of Scientific Apparatus. Note the Unit Packing System and the Use of Corrugated Boxes, Insuring Safe Arrival and Clean Apparatus.



One Section of Our Reserve Stock.

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*W. D. C
No. 11, page 1

TO OUR CUSTOMERS

In preparing this edition of our Chemical, Industrial and Bacteriological Catalog, we have endeavored to take into consideration all of the factors which influence selection of scientific apparatus by the varied and ever increasing group of scientific workers in the laboratories of this and other countries.

STANDARDIZATION BY AMERICAN CHEMICAL SOCIETY.

In accordance with the urgent recommendation of the United States Department of Commerce, we have joined heartily in the movement to standardize types and sizes wherever possible, eliminating all those which appear unnecessary and obsolete. In this we have been guided chiefly by the desires of the **American Chemical Society** as expressed through the reports of the **Committee on Standardization**, published in the official journals of the society*, and have omitted from this catalog types and sizes recommended by them for elimination. Since a reduction in the number of items handled increases the production and decreases the overhead expense of each, a material saving to the buyer is effected through reduced costs. A further advantage lies in the smaller investment in the numerous types of apparatus rarely used, and in the possibility of different laboratories in the same institution making use of the same stock of apparatus. We hope, therefore, that we may be supported in this action by the scientists of this country in whose behalf and at whose request this action was undertaken.

SPECIAL ITEMS.

Any items formerly offered, which are not found in this catalog, are classed by us as "specials" upon which prices will be quoted upon request to any who are interested. Such prices will naturally be higher in proportion than those of merchandise made in large quantities and carried in stock.

POLICY.

The policy of handling only American made apparatus and chemicals was adopted by us only after careful consideration and was consistently carried out as long as we were assured of the support of American scientists. It has been with the greatest reluctance that we have been compelled in some instances to depart from this policy, due either to actual demand on the part of laboratory workers for certain specific items of foreign manufacture or to their unwillingness or inability to pay the higher prices for domestic material necessitated by higher labor costs, difference in rate of exchange, etc.

PROMPT DELIVERIES.

It is our ambition to render the greatest service possible to scientific workers and we realize that promptness in securing supplies is one of their foremost requirements. With this in mind we have built up a large stock of the material in most common use which we endeavor to maintain at all times in order to be able to make shipment at once of any reasonable order. Of the less common items we attempt to carry a sufficient stock to insure ample time for replenishments without the necessity of back-ordering.

PRICES.

In accordance with the tendency toward lower prices we have reduced our prices as much as lowered costs would permit. Upon goods of our own manufacture we have anticipated reductions in cost on future lots in order that our catalog prices may remain stable as long as possible. Additional reductions in price will continue to be put into effect as rapidly as new costs are realized. This should be kept in mind in making any comparisons of printed prices.

OUR RESPONSIBILITY.

We employ only experienced packers and use every precaution to make sure that no items are omitted from the shipment and that everything is well packed to withstand transportation. However, in spite of such safeguards errors are occasionally made in our own organization, and there is no assurance that even the most carefully packed material will survive the hazards of damage in transit. Realizing that we are better equipped to press claims for damage than are most of our customers, we are glad to assume this responsibility, provided an immediate detailed report is made of the damage on blanks sent by us in every box, accompanied by the proper affidavit. Without awaiting the successful adjustment of the claim, we will proceed at once to make replacement or issue credit, as desired, for the damaged items. To cover the expense involved, a nominal insurance charge is made on each shipment, unless we are instructed to the contrary, in which event goods will be sent at the shipper's risk.

GUARANTEE.

All items purchased from us are sent out under our positive guarantee that they meet fully the specifications contained in our catalog, and any items found defective in any respect should be returned at once at our expense. Furthermore, any items purchased from us which, upon examination, are found not to satisfy the customer's requirements, even though they fulfill our catalog specifications, may be returned for credit. In such cases a charge of ten per cent will be made to cover the expenses of inspection, unpacking and repacking.

ORIGINAL CASES.

We especially recommend that our customers take advantage of quantity purchases. American manufacturers of glassware, porcelain and filter paper have made it possible to secure these commodities in original case lots at wholesale prices.

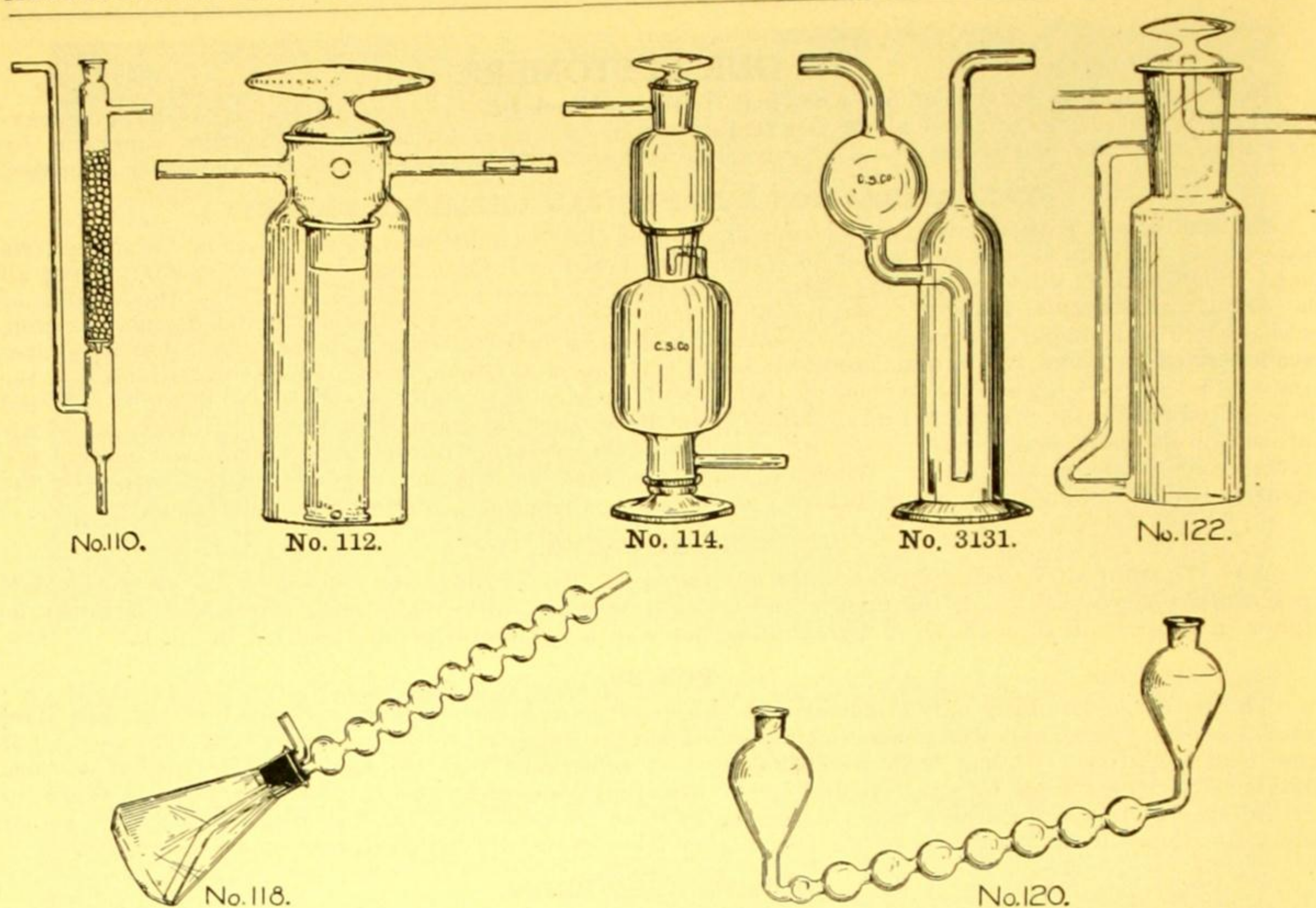
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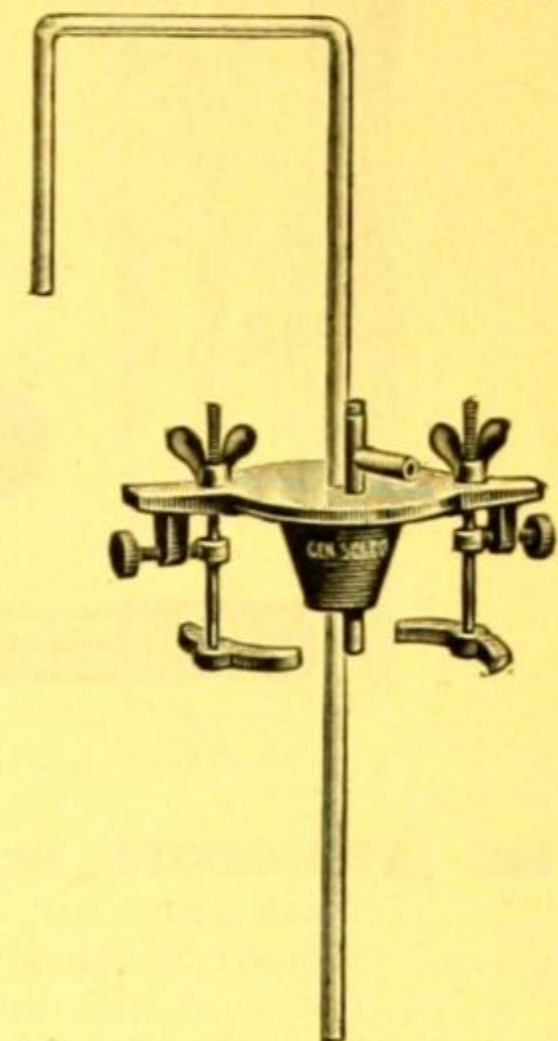
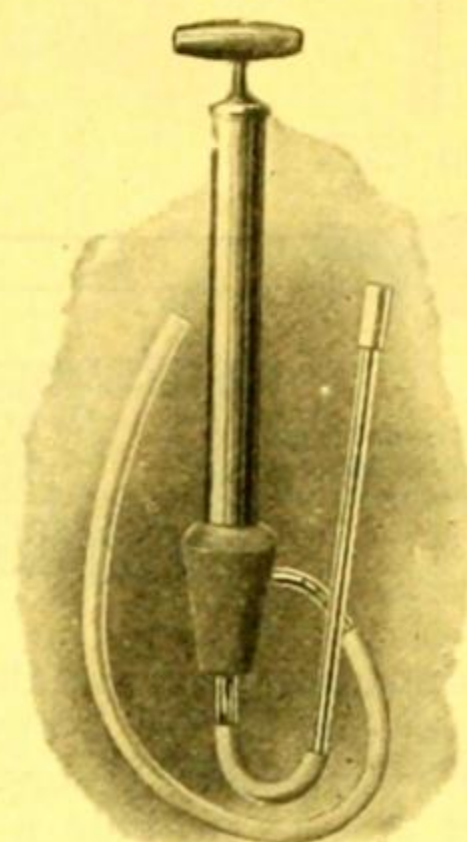
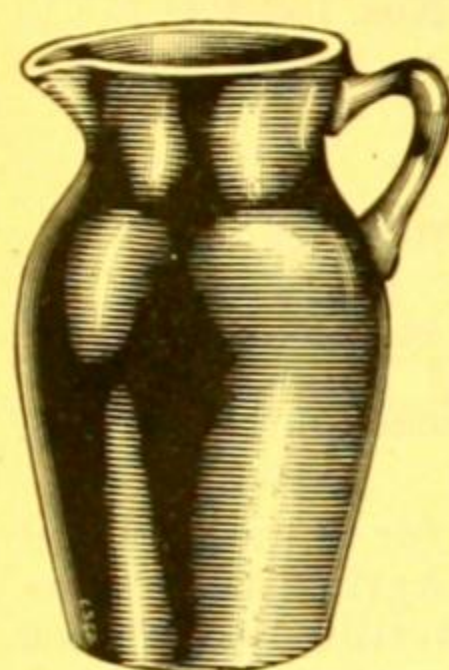
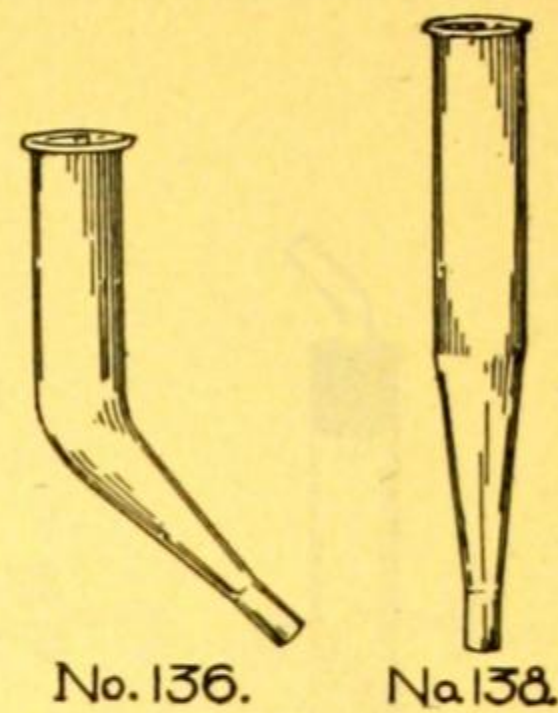
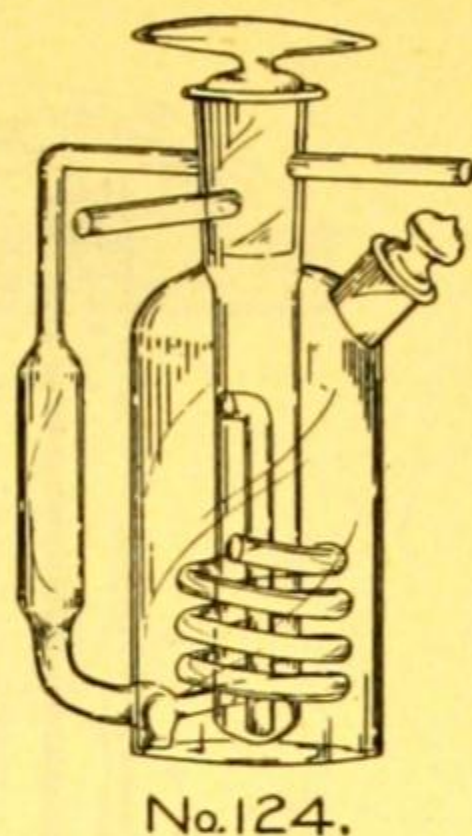
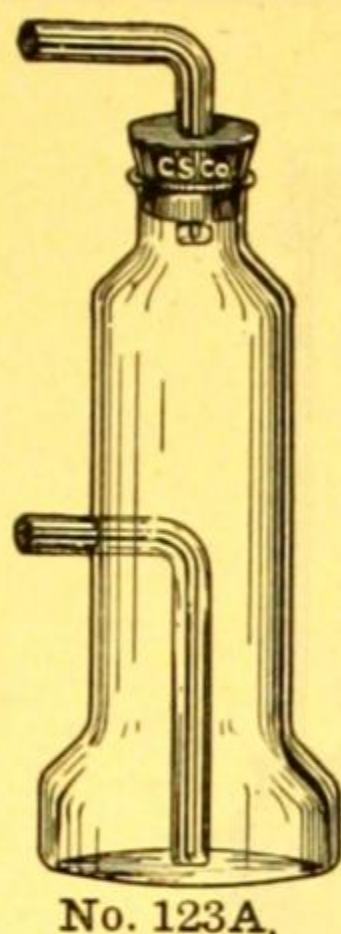
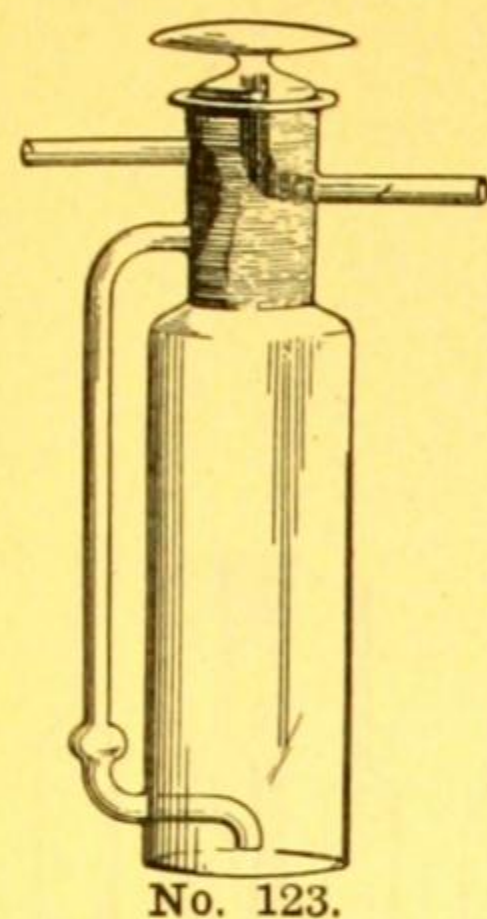
CENTRAL SCIENTIFIC COMPANY.

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*W. D. Collins, Chairman, *Journal of Industrial and Engineering Chemistry*, Vol. XIII, No. 5, page 402 and No. 11, page 1070; also Vol. XIV, No. 7, page 654.



102. **ABSORBENT COTTON**, best quality.
- | Size of package..... | 1 oz. | 4 oz. | 16 oz. | 5 lbs. |
|----------------------|--------|-------|--------|--------|
| Each | \$0.22 | .40 | .70 | 2.65 |
- ABSORPTION APPARATUS** for Chlorine, see No. 2828.
- ABSORPTION BULBS**, see Potash Bulbs.
110. **ABSORPTION TUBE**, Emmerling's, filled with glass beads. Total length, 15½ inches; diameter of body, 1 inch. Will take an 8 inch column of beads..... 2.50
112. **ABSORPTION TUBE**, Fisher's, for the absorption of carbon dioxide or water in elementary organic analysis in place of the usual U tubes. It has the following advantages: 30 cc capacity instead of 22 cc of the ordinary 11 cm U tubes; more easily and thoroughly cleaned; only one hollow stopper which shuts off both openings with one turn; will stand on the balance pan; and needs no hangers when joined in the absorption train. When filled, the bottle weighs about 65 grams. (See Journal of Industrial and Engineering Chemistry, Vol. VIII, No. 4, for April 1916, page 368)..... 4.00
114. **ABSORPTION TUBE**, Fleming-Martin, for carbon determinations in iron and steel by the combustion method. Very rapid and exact, retaining every trace of carbon dioxide and moisture. One charge of soda lime will absorb 100 combustions, or one charge of phosphorus pentoxide 300 combustions on a 1.5 gram sample of 0.75 per cent. carbon steel..... 5.00
118. **ABSORPTION TUBE**, as used by the Illinois Steel Company for absorptions in barium hydroxide, consisting of 9 bulbs with bent stem, for use with a 500 cc Erlenmeyer flask. Total length of tube, 20½ inches. Without flask. (See Journal of Industrial and Engineering Chemistry, Vol. VI, No. 10, for October 1914, page 844)..... 1.20
3132. **ABSORPTION TUBE**, Johnson's, as used in the carbon combustion train devised by C. M. Johnson of the Crucible Steel Co. For complete description of the combustion train, see No. 3120 1.80
120. **ABSORPTION TUBE**, Meyer's, for the absorption of carbon dioxide in barium hydroxide; as described in Standard Methods for Chemical Analysis of Plain Carbon Steel, adopted in 1914 by the American Society for Testing Materials. Consists of a series of 10 small bulbs holding from 10 to 15 cc each, with large bulbs at the ends each having a capacity equal to that of the small bulbs combined..... 2.60
122. **ABSORPTION TUBE**, Nesbitt's, for the absorption of carbon dioxide in soda lime in the determination of carbon in iron and steel, designed by C. E. Nesbitt, chief chemist of the Carnegie Steel Company, Edgar Thomson Works. A slight turn of the stopper closes inlet and outlet tubes, sealing the bulb for weighing. The bulb filled weighs about 135 grams. Very rapid, enabling combustions to be run in 6 minutes. As many as 100 combustions may be run on a 0.50 per cent. carbon steel with 1.5 gram samples without refilling..... 3.50



No. 123.

No. 123A.

No. 124.

No. 136.

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No. 132.

No. 134.

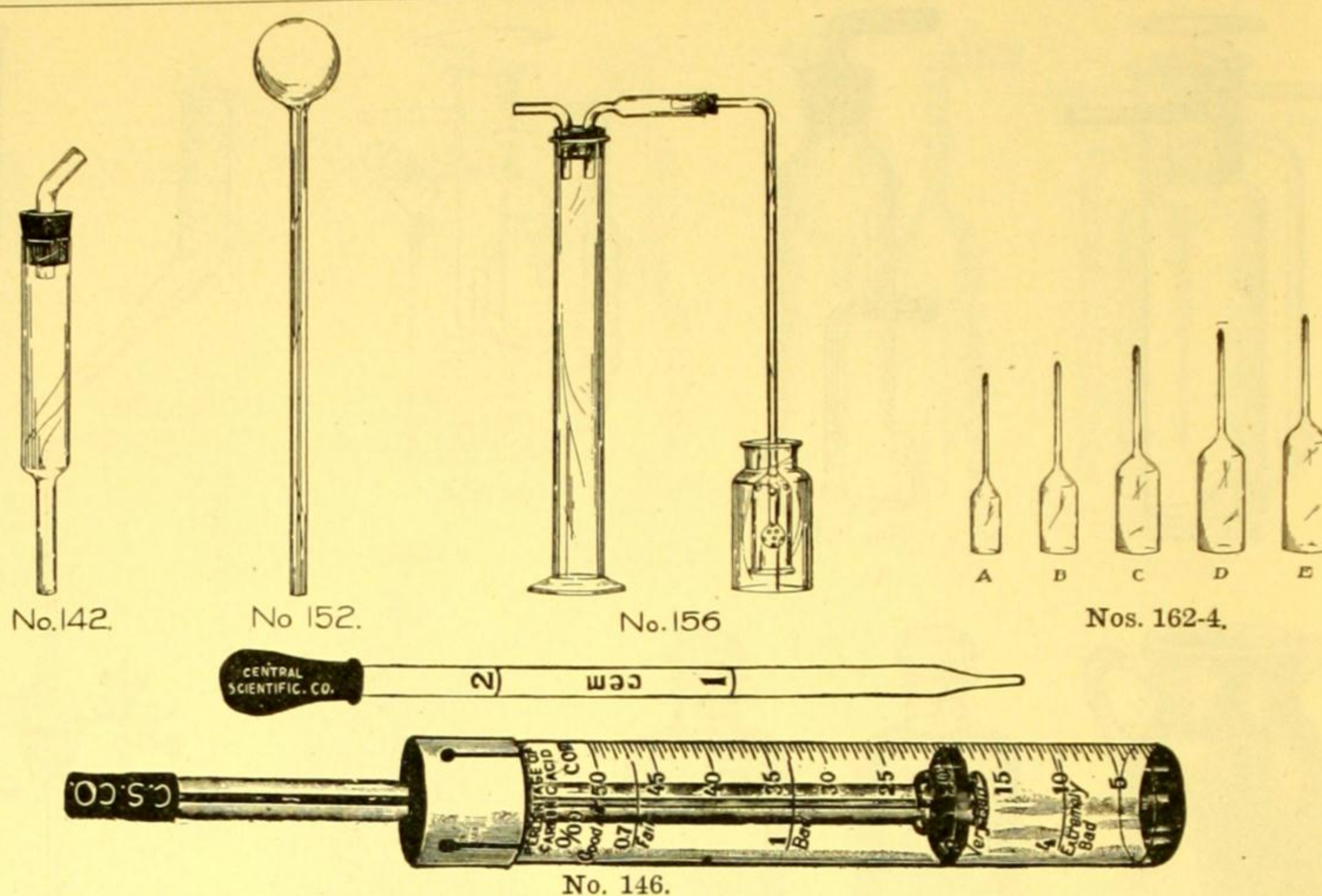
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| 123. | ABSORPTION TUBE, Nesbitt's Improved , same as No. 122, but with inlet tube extended inside bulb and bent downward to diffuse gas through entire bottle..... | \$4.00 |
| 123A. | ABSORPTION TUBE, Stetser-Norton , as modified by J. B. Stetser and R. H. Norton of the Penn. Seaboard Steel Corporation from the original design by H. L. Frevert of the Midvale Steel Co., and used by them to replace the Vanier Bulb in the combustion method of determining carbon in steel. When filled with Ascarite, a sodium hydroxide-asbestos mixture devised by Stetser and recommended for use with it, the bulb weighs about 100 grams and can be used for about 400 determinations of a .50% carbon steel, using a one-half carbon factor sample. Height over all, 120 mm; diameter at bottom, 45 mm. Complete with rubber stopper and capillary tube | 1.50 |
| 124. | ABSORPTION TUBE, Vanier's (patented), for the absorption of carbon dioxide in potassium hydroxide in determining carbon in steel by the combustion method.- Designed by George P. Vanier, Chief Chemist of the Pennsylvania Steel Company. Consists of a potash bulb and drying tube combined, capable of absorbing 100 combustions without refilling..... | 6.00 |
| For other ABSORPTION TUBES AND BULBS , see Calcium Chloride Tubes; Potash Bulbs. | | |

ACID BASINS OR DISHES, see Dishes.

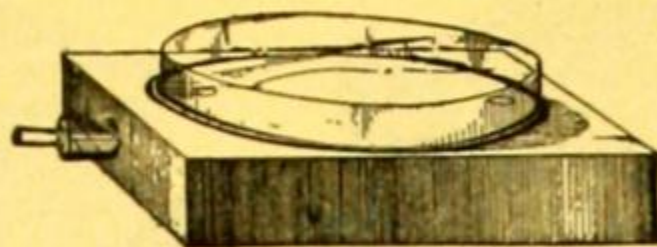
ACID JARS, see Jars.

ACID MEASURES FOR MILK, see Milk Testing Apparatus.

- | | | | | |
|------|---|-----|-----|------|
| 128. | ACID PITCHERS , of stoneware, with handle. | | | |
| | Capacity, quarts..... | 2 | | 4 |
| | Each | .60 | | 1.20 |
| 130. | ACID PROOF FINISH , for chemical laboratory tables. While this preparation is not absolutely acid proof, it is a finish which has been successfully employed for years in many of the leading laboratories. Consists of two solutions with full directions for applying. The finished top will be black. One gallon will cover 300 square feet. Per gallon (1½ gallon of each solution) | | | 2.50 |
| 132. | ACID PUMP , with force pump attached, for withdrawing acid from containers. Will fit any bottle or carboy having a neck from 1¾ to 2½ inches diameter | | | 9.00 |
| 134. | ACID PUMP for drawing acids and ammonia from carboys. Clamps hold it firmly to neck of carboy. Can be operated by Air Pump No. 10986, or Foot Blower No. 1374..... | | | 7.50 |
| 136. | ADAPTERS, curved , of light glass, lamp blown, bent at an angle of 45 degrees, for use with retorts and condensers. | | | |
| | No. | A | B | C |
| | Length, mm. | 150 | 180 | 200 |
| | Inside diameter at large end, mm..... | 18 | 25 | 30 |
| | Each | .20 | .25 | .30 |
| 138. | ADAPTERS , same as No. 136, but straight. | | | |
| | No. | A | B | C |
| | Each | .20 | .25 | .30 |



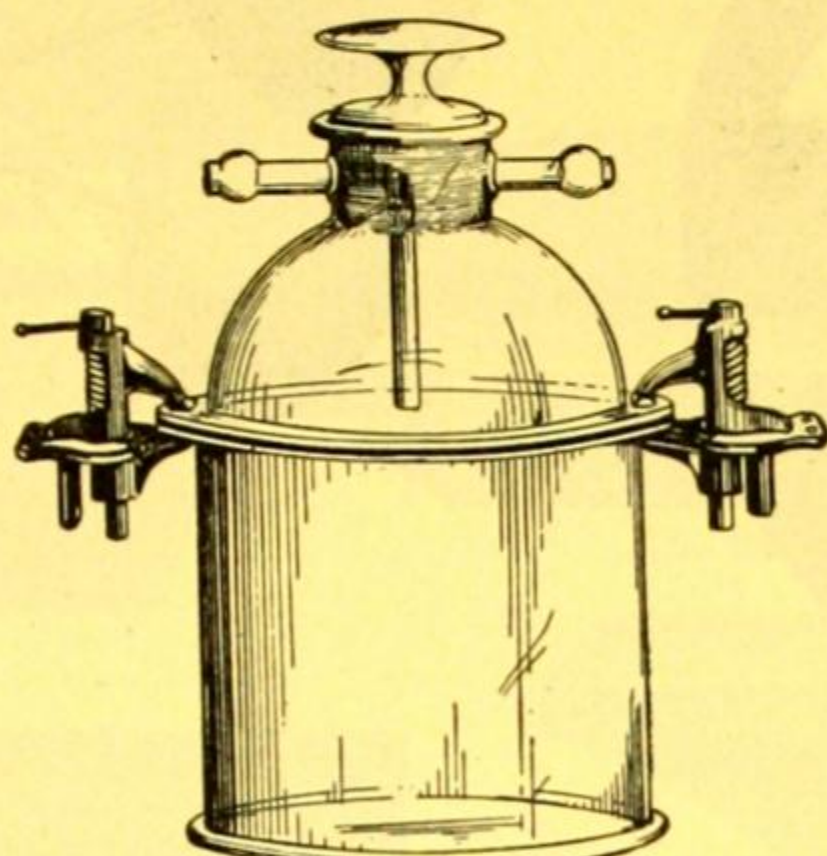
142. **AEROSCOPE**, Standard, adopted by the American Public Health Association for obtaining bacteria from air, according to the design of G. L. A. Ruehle, of the New York Agricultural Experiment Station. Consists of a tube, made of resistance glass to withstand sterilization, drawn down at the lower end to provide a shoulder for supporting a layer of cotton and sand. Length of tube, 110 mm; diameter outside, 15 mm. Complete with selected cork stopper and bent tube. (See Journal of Agricultural Research, Vol. IV, No. 4, for July, 1915.)..... \$0.50
- AGRICULTURAL APPARATUS**, see Soil Analysis Apparatus.
- AIR BATHS**, see Drying Ovens.
- AIR METERS**, see Anemometers.
- AIR PUMPS, BLOWERS**, see Blowers.
- AIR PUMPS** for Vacuum and Pressure, see Filter Pumps; Pumps, Air.
- AIR PUMPS** for Vacuum and Pressure, see Pumps, Air.
146. **AIR TESTER**, Wolpert's (Carbacidometer), for obtaining the amount of carbonic acid gas in a room by direct readings from the graduations etched on the glass, thus doing away with all computations and tables as in the old forms. Another advantage of this form is that the air of a room may be secretly tested, if desired. Directions and full set of capsules for making test solutions furnished with each instrument 4.50
147. **EXTRA CAPSULES** for No. 146. In boxes of 12 capsules (six of each reagent)..... **Per box** .25
150. **AIR THERMOMETER TUBE**, of glass, with stem 30 cm long. Diameter of bulb, 50 mm. 15% discount in lots of 12. each, .20
152. **AIR THERMOMETER TUBE**. Same as No. 150, but with capillary stem. Diameter of bulb, 50 mm 15% discount in lots of 12. each .35
- ALBUMINOMETERS**, see Urine Analysis Apparatus.
- ALCOHOLOMETER**, see Hydrometers.
- ALKALIMETERS**, see Carbon Dioxide Determination Apparatus.
- ALUNDUM CEMENT, COMBUSTION BOATS, CRUCIBLES, DISHES, FILTERS, ETC.**, see Cement, Combustion Boats, Crucibles, Etc.
- AMMETERS**, see Electrical Instruments.
156. **AMMONIA ABSORPTION APPARATUS**, Folin's, complete with Folin Absorption Tube, cylinder with rubber stopper, drying tube, and bottle. Height of cylinder, 15 inches; capacity of bottle, 4 ounces..... 3.20
157. **AMMONIA ABSORPTION TUBE**, Folin's. Tube only of No. 156..... 1.50
158. **CONNECTING TUBE**, only of No. 156. Takes No. 2 rubber stopper..... .30
- For other **FOLIN APPARATUS**, see Blood Testing and Urine Analysis Apparatus.
162. **AMPOULES**, of clear resistance glass, with flat bottom.
- | No. | A | B | E | K | L |
|--------------|------|------|------|------|------|
| Capacity, cc | 1 | 2 | 5 | 10 | 25 |
| Per 100 | 1.50 | 1.50 | 2.50 | 4.20 | 8.00 |
164. **AMPOULES**, same as No. 162, but of amber glass.
- | No. | A | B | E | K | L |
|--------------|------|------|------|------|------|
| Capacity, cc | 1 | 2 | 5 | 10 | 25 |
| Per 100 | 1.50 | 1.50 | 2.50 | 4.20 | 8.00 |
- 20% discount in lots of 1,000 from all sizes of Nos. 162 and 164.
- AMPOULES** with Rubber Stoppers, see Bottles, Serum.



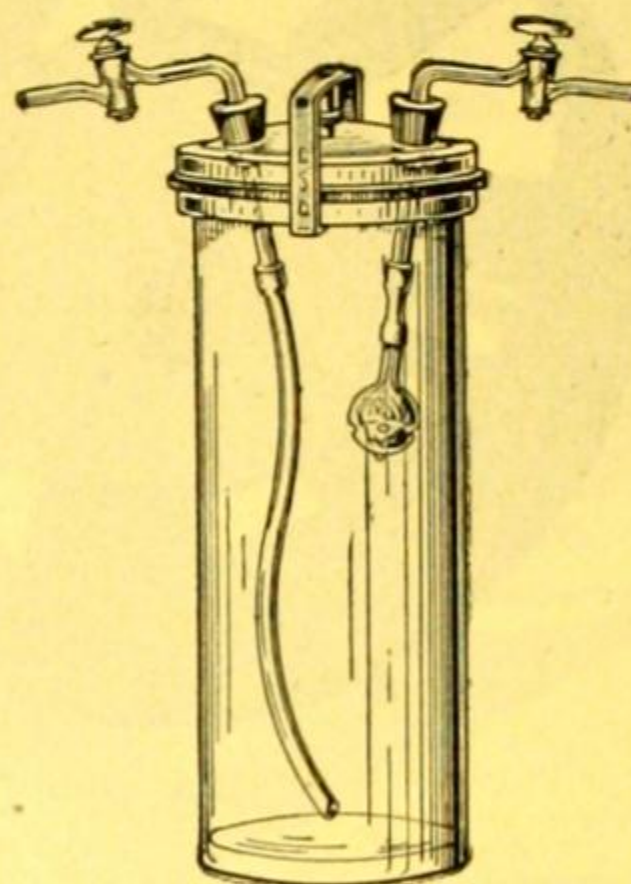
No. 168.



Buchner Tube.



No. 170.



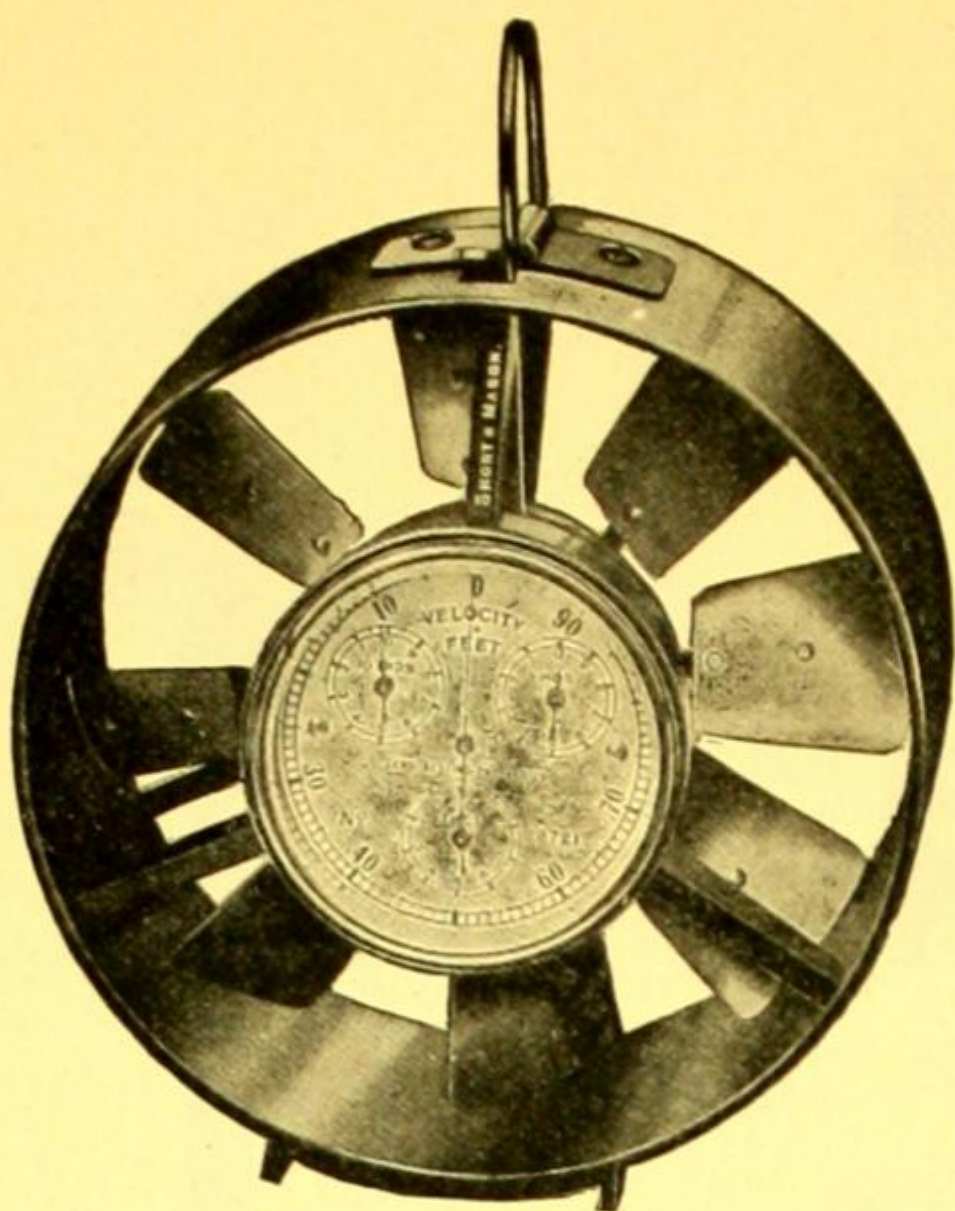
No. 172.

ANAEROBIC CULTURE APPARATUS

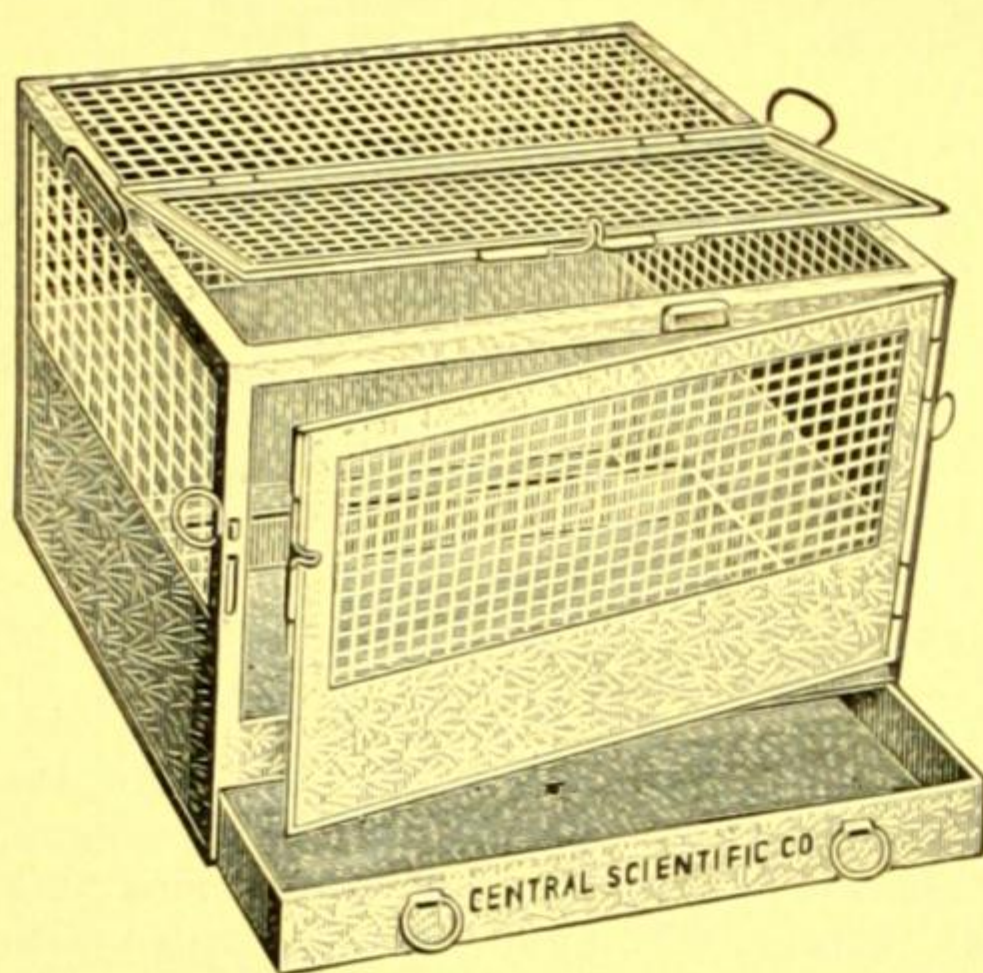
ANAEROBIC CULTURE APPARATUS, Buchner. This outfit consists simply of a large test tube, for which our No. 13370D Pyrex tube will be found suitable, in which the alkaline pyrogallol is placed, a simple support of wood or cotton on which is placed a small culture tube such as our No. 13366B, and a solid rubber stopper No. 11572 No. 5. The price of the parts will be found under their respective numbers.

For a full discussion of Anaerobic methods, see Tanner's "Bacteriology and Mycology of Foods," pages 17 to 23.

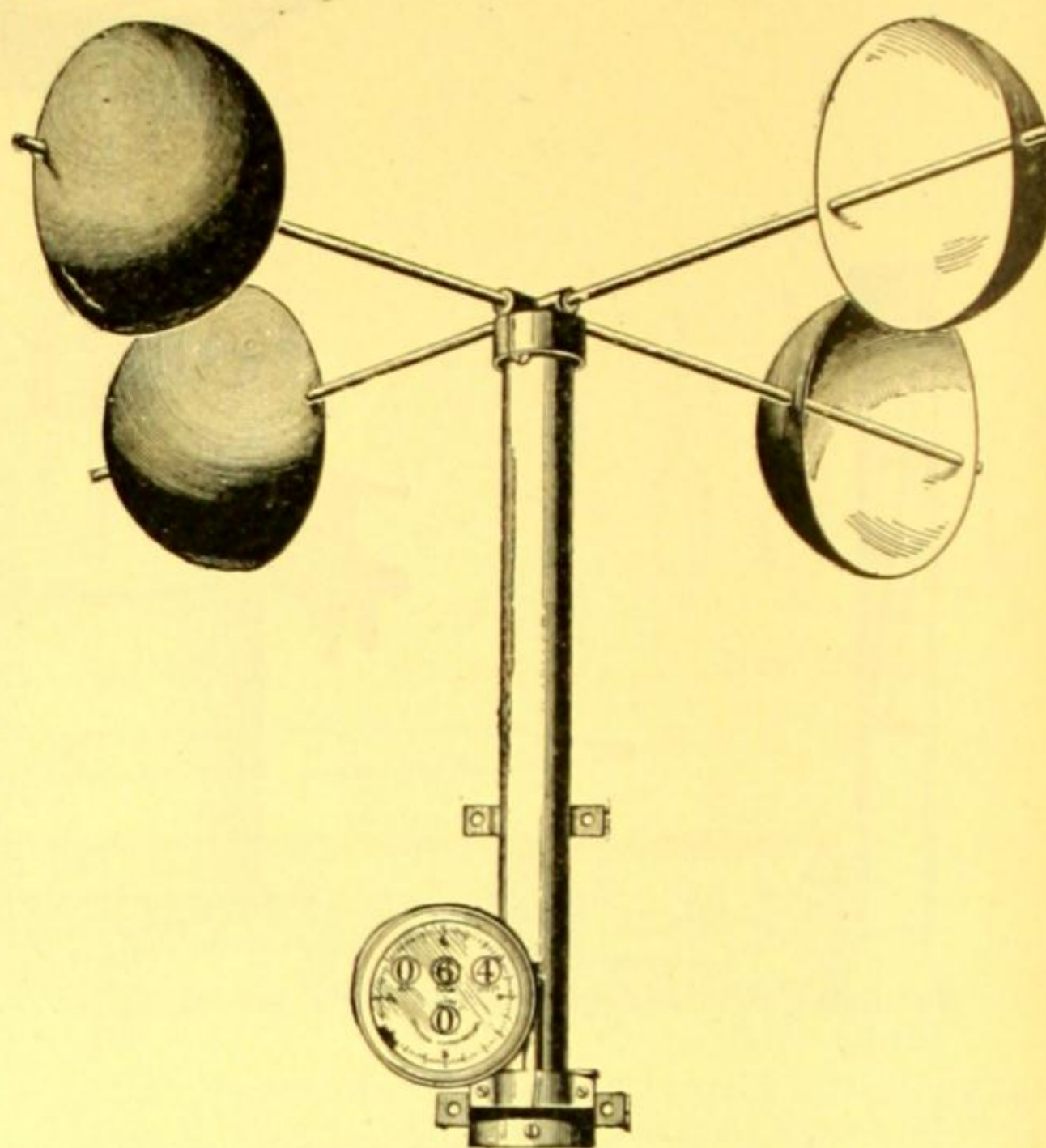
168. **ANAEROBIC CULTURE APPARATUS**, designed by H. M. Jones, of the United States Department of Agriculture. Consists of an Alberene stone base 2 cm thick and 12 cm square, with an annular groove to receive an inverted 100 mm Petri dish. The base is provided with outlet tubes so that gas and pyrogallate methods may be used. The groove may be sealed with paraffine or other wax. The small amount of air enclosed, about 20 cc, permits rapid results to be secured, which are readily visible. (See Journal of Bacteriology, Vol. I, No. 3, for May 1916, page 339.)..... \$1.80
170. **ANAEROBIC CULTURE JAR**, Novy's, for gas and pyrogallate methods, with removable top permitting Petri dishes to be used. The two sections can be clamped firmly together, and are furnished with a rubber gasket in addition to ground flanges, making an air tight joint. Height of lower section, 100 mm; diameter, 140 mm. Complete with three metal clamps and gasket 11.00
172. **ANAEROBIC CULTURE APPARATUS**, Smillie, especially designed by the author for the study of strict anaerobes such as *B. botulinus*. The method depends upon the catalytic action of platinized asbestos upon oxygen and hydrogen when they are brought in contact. The apparatus consists of a heavy walled No. 8054K Museum Jar, through the glass cover of which have been drilled two holes in which are inserted rubber stoppers carrying bent glass stop-cocks. One stop-cock has attached to its inner end a perforated glass bulb filled with platinized asbestos; to the end of the other is attached a piece of rubber tubing extending to the bottom of the jar. The cover is held in place by the usual clamp, a rubber gasket being used to make a gas tight joint. (For a complete description of the method, see Smillie's article in The Journal of Experimental Medicine, Vol. XXVI, No. 1, for July 1917, page 59, "New Anaerobic Methods." The same outfit will be found useful for either gas, vacuum or pyrogallate methods, and is particularly valuable because of the number of petri dishes or tubes which may be placed in it. Diameter of jar inside, 5 inches; depth inside, 12 inches. Complete as illustrated..... 11.50



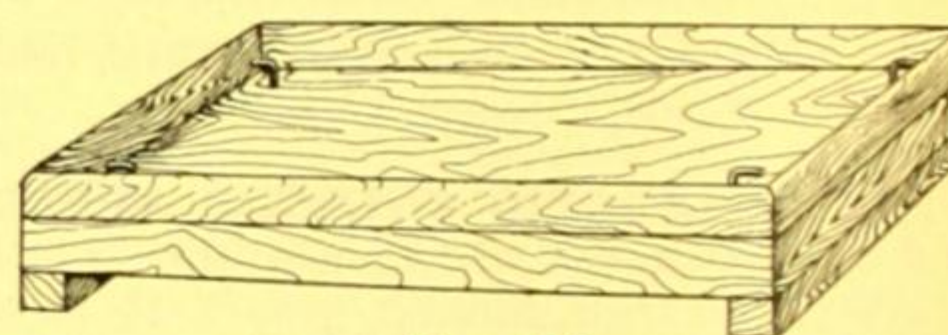
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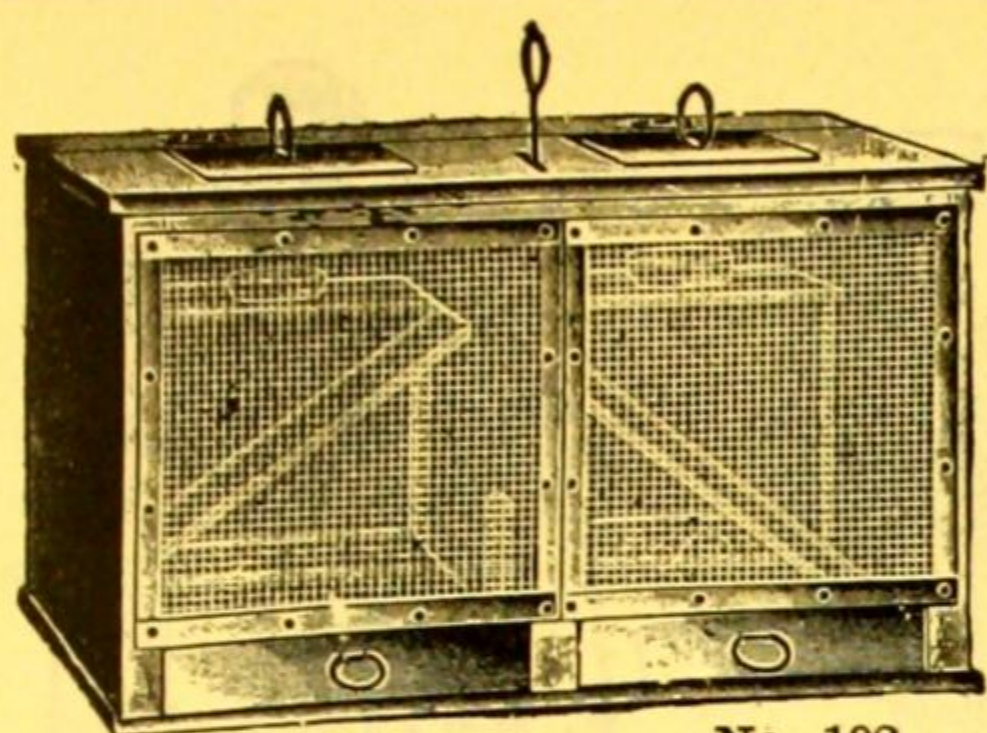


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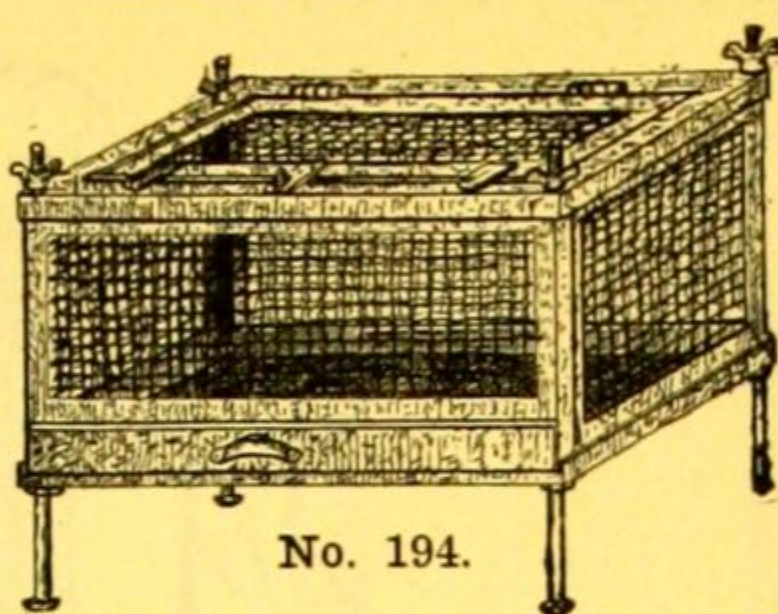


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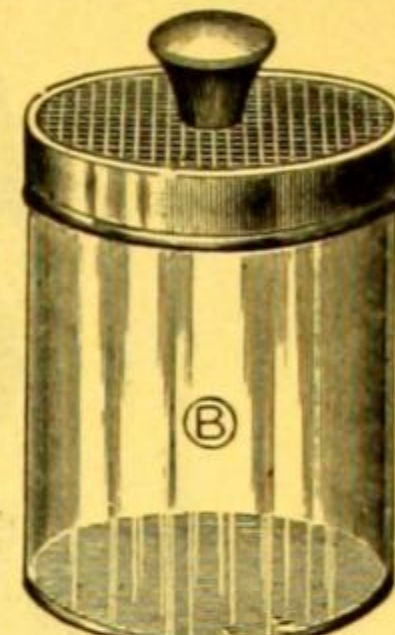
180. **ANEMOMETER**, Biram's, 4 inches in diameter, with four dials reading to 100,000 feet. Accurately made and finely finished, with jewelled bearings. Complete with zero setting attachment, in leather case..... \$45.00
184. **ANEMOMETER** or **WIND GAGE**, for indicating the velocity of the wind in miles, consisting of a vertical shaft, to the upper end of which are fastened four arms, each carrying a Robinson hemispherical copper cup. These cups turn in one direction, regardless of the direction of the wind. The registering dial is so divided as to show velocities from one hundredth of a mile to 10,000 miles. All parts are interchangeable. Each instrument is standardized and fully warranted. Weight, 3½ lbs..... 42.50
186. **ANIMAL BOARDS**, of wood, with hook in each corner, for use in animal experiments. Small size suitable for guinea pigs and rats; large size for cats and small dogs.
- | No. | A | B |
|------------|------|------|
| Length, mm | 320 | 650 |
| Width, mm | 200 | 300 |
| Each | 3.00 | 4.80 |
188. **ANIMAL CAGE**, scientifically designed and constructed, affording humane conditions and entire security and convenience in studying animals undergoing bacteriological or microscopical examination. The removable pan in the bottom renders the daily care of the animals easy, and permits the employment of every precaution for insuring cleanliness. Dimensions: 18 inches long, 18 inches wide, and 13½ inches high 15.00



No. 192.



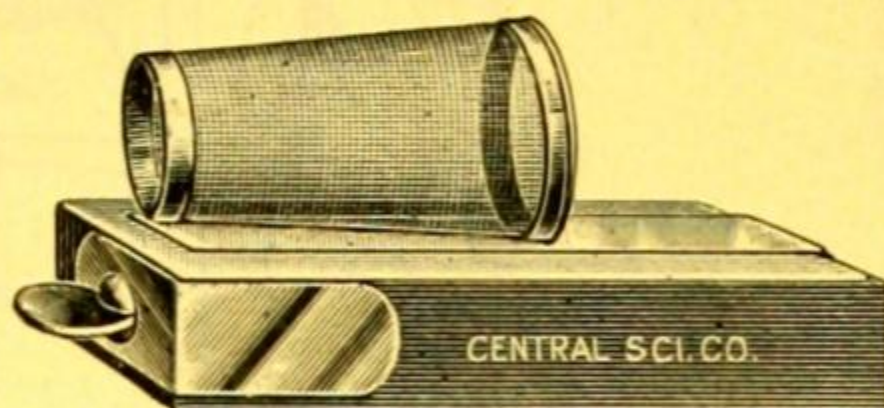
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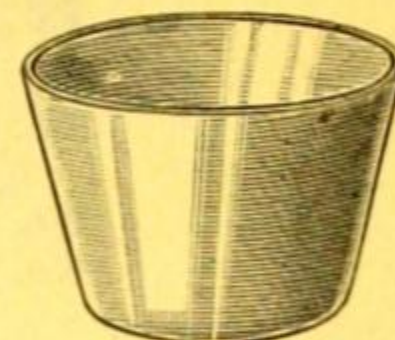
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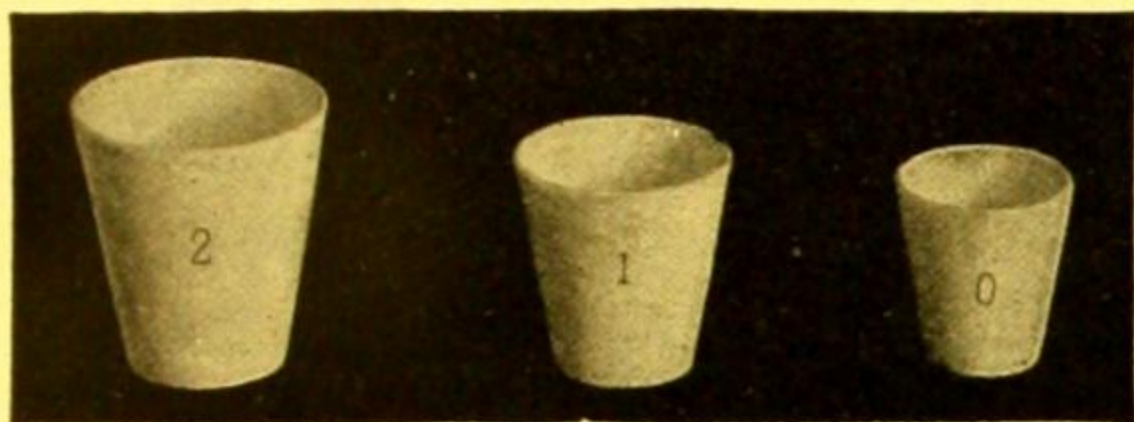
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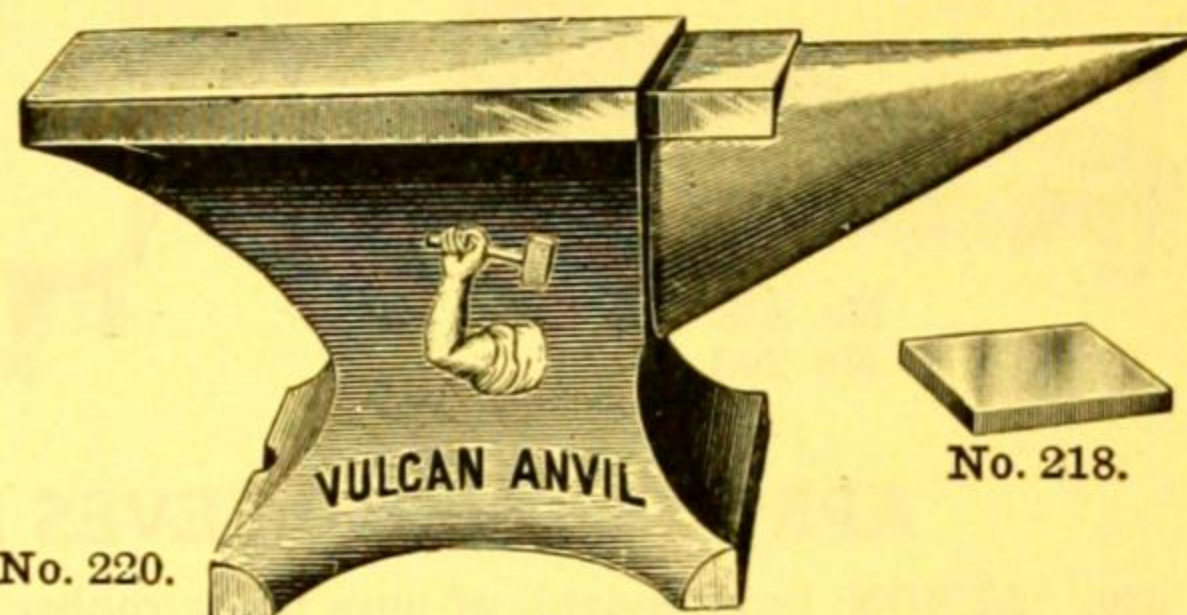
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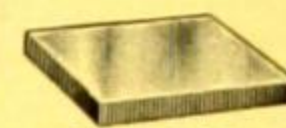
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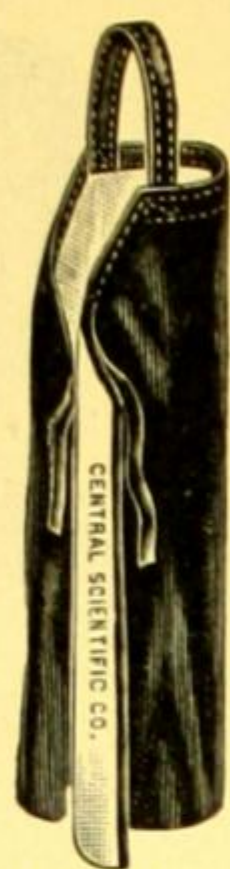


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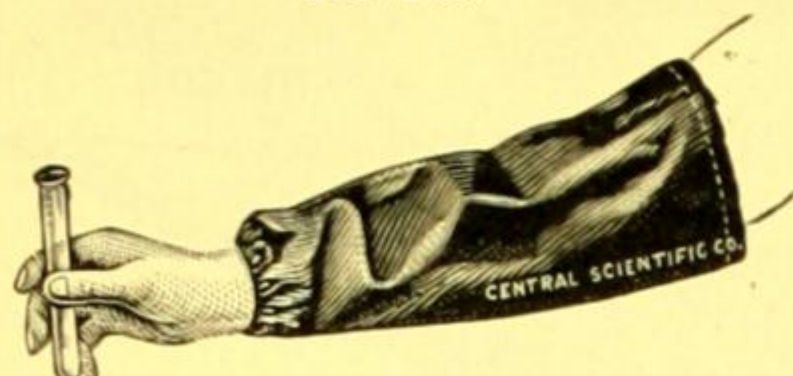


No. 218.

192. **ANIMAL CAGE**, Heim, with two compartments, for breeding mice and other small rodents. Made of wood, lined with galvanized iron, with shelf for food, runway of wire cloth and removable drawers. Dimensions, 20 x 12 x 12 inches \$22.00
194. **ANIMAL CAGE**, Vaughan's, collapsible, rendering it easy to sterilize. Sides, bottom, and top come apart so that it can be packed away in small space. Height of cage, 12 inches; length, 20 inches; width, 15 inches; height over all, 17 inches..... 13.50
196. **ANIMAL CAGE**, Mouse Jar, of glass, 5 inches in diameter by 7 inches high, with wire gauze top loaded with a heavy cast iron knob..... 2.00
- ANIMALCULAE CAGES**, see **Projection Apparatus**.
For **INSECT CAGES**, see Nos. 8000 and 8004.
200. **ANIMAL HOLDER**, of metal, for inoculating mice, with adjustable clamp for holding the tail. Cage may be removed from base. The top is slotted to permit abdominal inoculation when animal is held on its back..... 5.00
204. **ANIMAL HOLDERS**, Voge Guinea Pig Holders, for inoculation, measurement of temperature, etc. Consists of a slotted cylinder of polished zinc with perforated base.
- | No. | A | B |
|--------------|------|------|
| Height, mm | 180 | 200 |
| Diameter, mm | 60 | 80 |
| Each | 1.50 | 1.75 |
206. **ANIMAL TAGS**, of aluminum, with hole and staple for attachment to ears of rabbits, dogs, etc. Numbered consecutively in series of hundreds Per hundred 3.20
- Note**:—In ordering, specify the series of numbers desired.
214. **ANNEALING CUPS**, of selected clay. Used extensively for silica fusions.
- | No. | 0 | 1 | 2 |
|--------------|---------------|---------------|---------------|
| Size, inches | 1 1/8 x 1 1/8 | 1 3/8 x 1 3/8 | 1 5/8 x 1 5/8 |
| Per dozen | 2.50 | 2.50 | 2.50 |
215. **ANNEALING CUP COVERS**.
- | For cups No. | 0 | 1 | 2 |
|--------------|-----|-----|-----|
| Per dozen | .75 | .75 | .75 |
216. **ANNEALING CUP**, Coors Porcelain, glazed throughout with exception of outside bottom surface. Diameter at top, 38 mm; diameter at bottom, 27 mm; height 25 mm; capacity, 15 cc .22
218. **ANVIL**, Plattner's, of case-hardened steel, for blowpipe analysis. Dimensions, 1 1/2 x 1 1/2 x 1/2 in.70
220. **ANVILS**, Regular Shape, steel face.
- | No. | A | B |
|---------------------------|------|--------|
| Weight in pounds | 15 | 50 |
| Length in inches over all | 9 | 14 1/2 |
| Each | 5.50 | 10.00 |



No. 236.
No. 240.



No. 238.
No. 242.



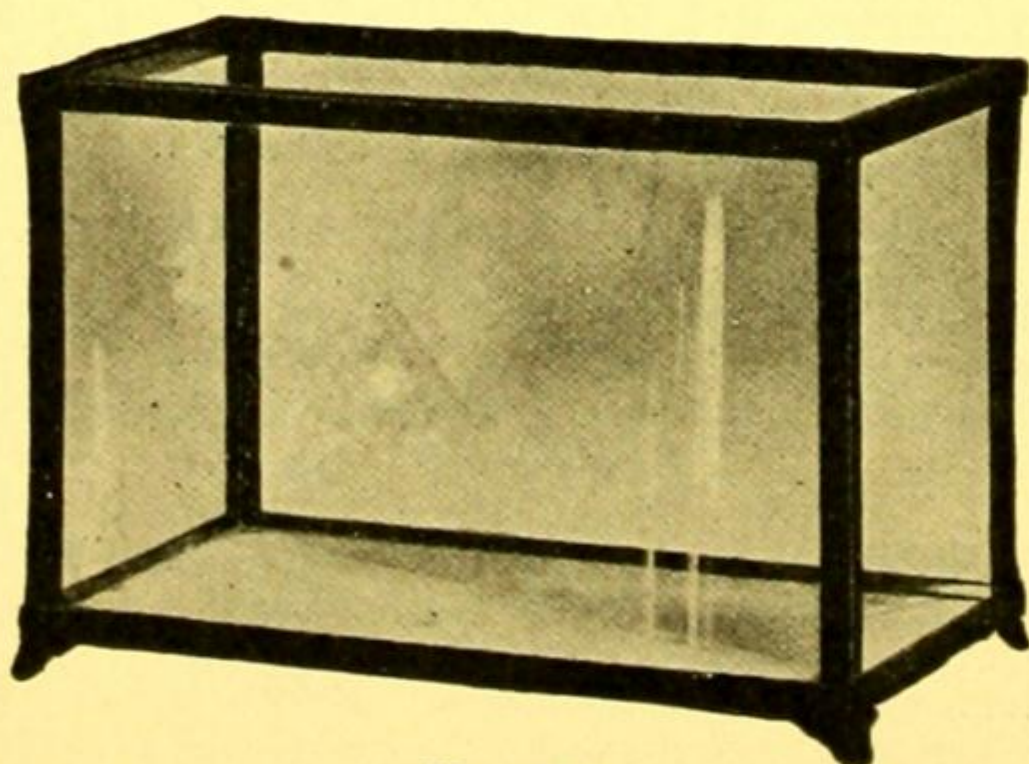
Nos. 252-4.



No. 260.

APRONS, OVERSLEEVES AND LABORATORY COATS

236. **APRON**, light weight, of pure black rubber cloth, acid and waterproof, very flexible, accommodating itself easily to any position of the body. Length, 46 inches..... \$0.60
10% discount in lots of 12.
238. **OVERSLEEVES**, of same material as No. 236 Apron, with elastic bands at top and bottom .35
10% discount in lots of 12.
240. **APRON**, of pure white rubber cloth, especially suitable for use in bacteriological, biological and hospital laboratories. Length, 46 inches..... 1.20
10% discount in lots of 12.
242. **OVERSLEEVES**, of same material as No. 240 Apron, with elastic bands at top and bottom. Per pair60
10% discount in lots of 12.
252. **LABORATORY COAT**, of white drill, affording complete protection to the clothing. Widely used in bacteriological, biological, food and flour laboratories. Buttons are easily removable for laundering; with three pockets and adjustable strap in back. Length, 54 inches. In ordering, give chest measure taken loose fitting..... 3.00
254. **LABORATORY COAT**, of tan covert cloth, with three pockets, side slits, removable buttons, and sleeves buttoning close to wrist. Length, 50 inches. In ordering, give chest measure taken loose fitting..... 4.50
260. **DISSECTING OR OPERATING GOWN**, long sleeved, of white drill, with one pocket and straps for fastening at neck and waist. Especially suitable for bacteriological and anatomical laboratories. Length, 52 inches. (Can be furnished in 58 inch length if desired.) In ordering, give chest measure taken loose fitting..... 3.10



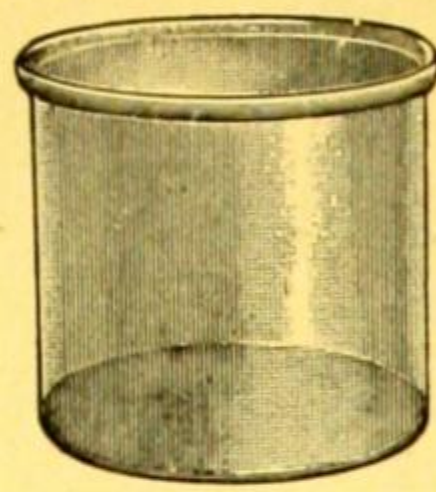
No. 274.

274. **AQUARIA**, steel frame, slate bottom, heavy glass sides; well made and nicely finished. The measurements in the table below are in inches over all.

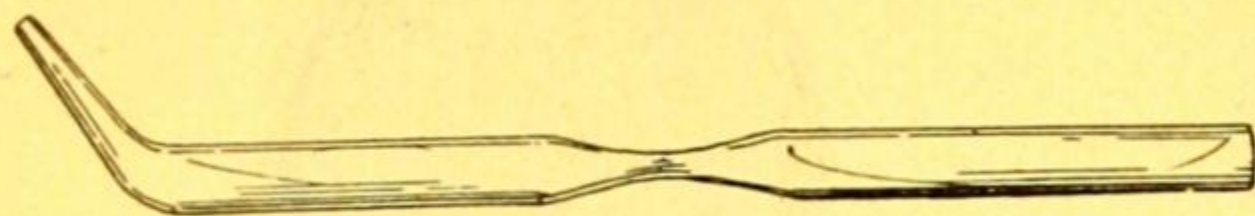
No.....	A	B	D
Length, inches...	12½	16½	20½
Width, inches ...	7	9	13
Height, inches ...	10	11	13
Capacity, gallons.	3	6	12
Each	7.00	9.00	12.50



No. 8042.



No. 286.



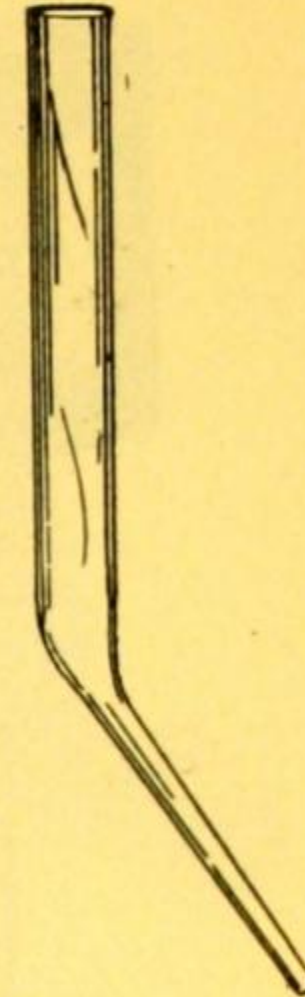
No. 304.



No. 294.



A



B

No. 302.



No. 306.



No. 300.

8042. **AQUARIA, Battery Jars, of clear white glass, with ground rim.**

No.	A	B	C	D	E
Diameter, mm	100	100	125	150	225
Height, mm	100	125	175	200	300
Each	\$0.70	.90	1.20	1.70	4.00

286. **AQUARIA, Round, of white glass, with reinforced rim.**

No.	A	B	C	D
Diameter, about, mm.....	175	225	250	300
Height, about, mm.....	175	225	250	300
Approximate capacity, liters.....	4	8	12	20
Each	2.20	3.30	5.50	7.50

294. **ARSENIC APPARATUS, Gutzeit-Bragg, with ground joints..... 1.40**300. **ARSENIC PLATE (Streak Plate), of unglazed porcelain for arsenic tests, 60x100x4 mm thick .48**302. **ARSENIC TUBES, of hard glass.**

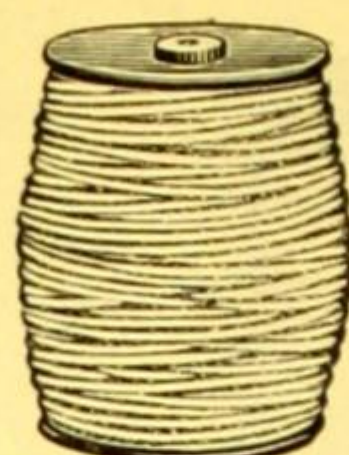
Style	A	B
Each	.10	.10

20% discount in lots of 100.

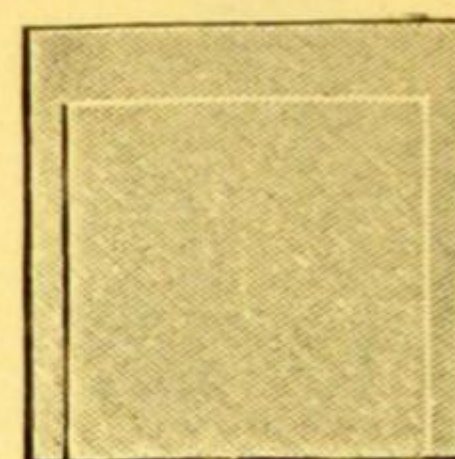
304. **ARSENIC TUBE, of combustion tubing, with constriction. Length, 15 inches..... .60**306. **ARSENIC TUBE, of transparent silica. Length over all, 6 inches; length of constriction, 3 in.
May be used repeatedly..... 1.20**



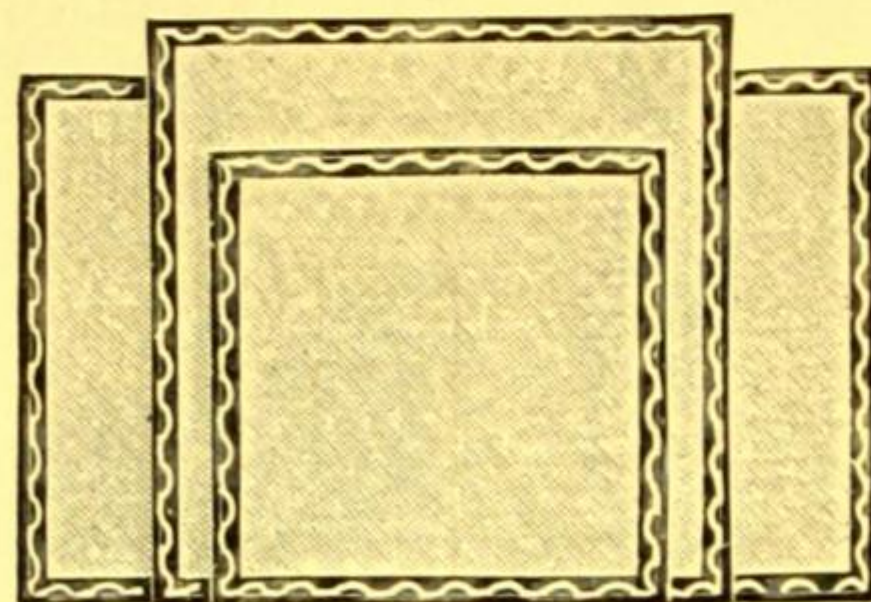
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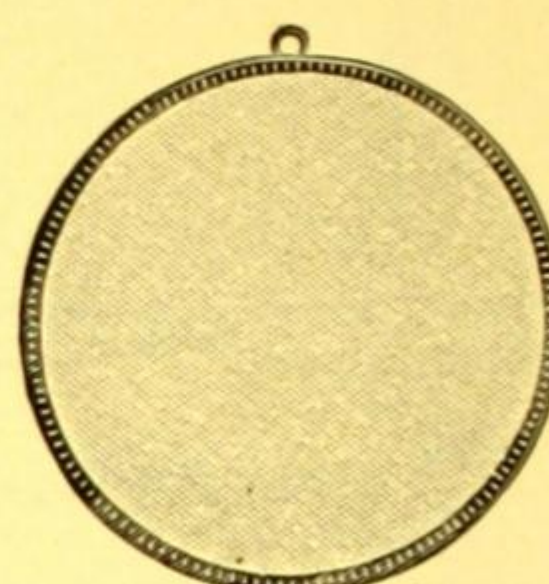
No. 312.



No. 322.



No. 316.



No. 318.

ASBESTOS MATERIAL

308. **ASBESTOS CEMENT** (Retort Cement), fire and acid proof, for use with muffles, retorts, electric furnaces, etc. Put up in cans ready for use.

Weight, pounds	1	5
Each	\$0.50	1.35

312. **ASBESTOS CORD or TWINE**, in $\frac{1}{4}$ pound balls.

No.	A	B
Diameter, inches	$\frac{1}{16}$	$\frac{1}{8}$
Per ball	1.00	1.00

ASBESTOS FIBER, or WOOL, see Chemical Catalog.

ASBESTOS GLOVES AND MITTENS, see Gloves.

314. **ASBESTOS PAPER**, for filtering acids, in rolls 36 inches wide, weighing about 1.3 pounds to the square yard. Thickness, about 0.028 inch. Per lb. .25

316. **ASBESTOS PADS**, $\frac{1}{8}$ inch thick, with iron bound edges; for protecting table tops, etc.

No.	A	B	D
Dimensions, inches	$8\frac{1}{2} \times 8\frac{1}{2}$	11×11	10×16
Each	.35	.55	.60

318. **ASBESTOS PLATE or PAD**, round, with iron bound edges and ring for suspension. Diameter, 8 inches

.10

320. **ASBESTOS SHEET**, 40x40 inches, fire and acid proof.

Thickness, inches	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$
Weight per sheet, lbs.	2	4	8	14
Per square foot	.10	.15	.45	.85
Per sheet	.60	.90	2.85	5.10

322. **ASBESTOS SHEETS**, square, $\frac{1}{16}$ inch in thickness.

No.	A	B
Dimensions, inches	5x5	6x6
Per dozen	.30	.40

20% discount in lots of 144.

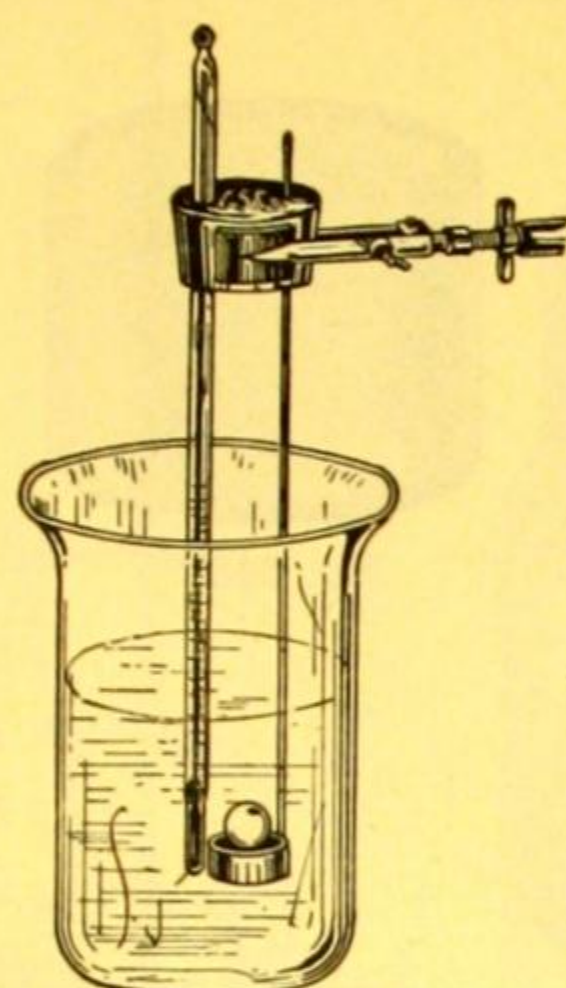
ASBESTOS SLATE, Transite, acid-proof, for protecting table tops, building apparatus, etc. The best laboratory material for heat and electrical insulation. Can be cut with ordinary saw.

Thickness, in.	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
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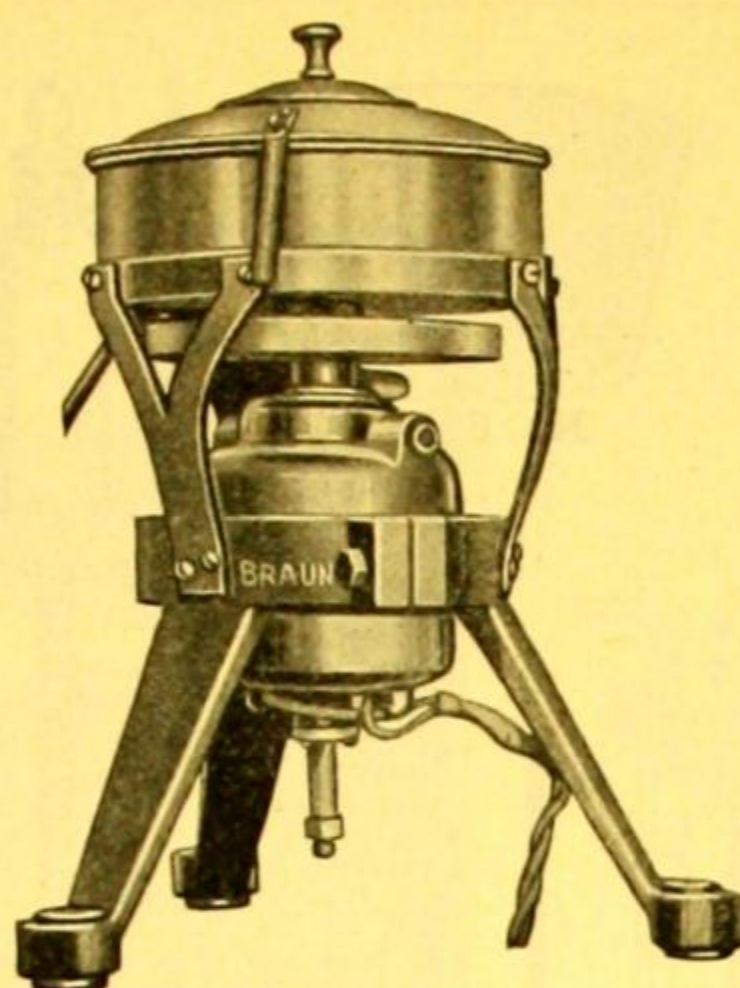
- 324A. **ASBESTOS SLATE**, 42x48 in. Per sheet 4.40 7.00 7.80 11.00 14.50

- 324C. **ASBESTOS SLATE** Per sq. ft. .35 .65 .75 1.05 1.50

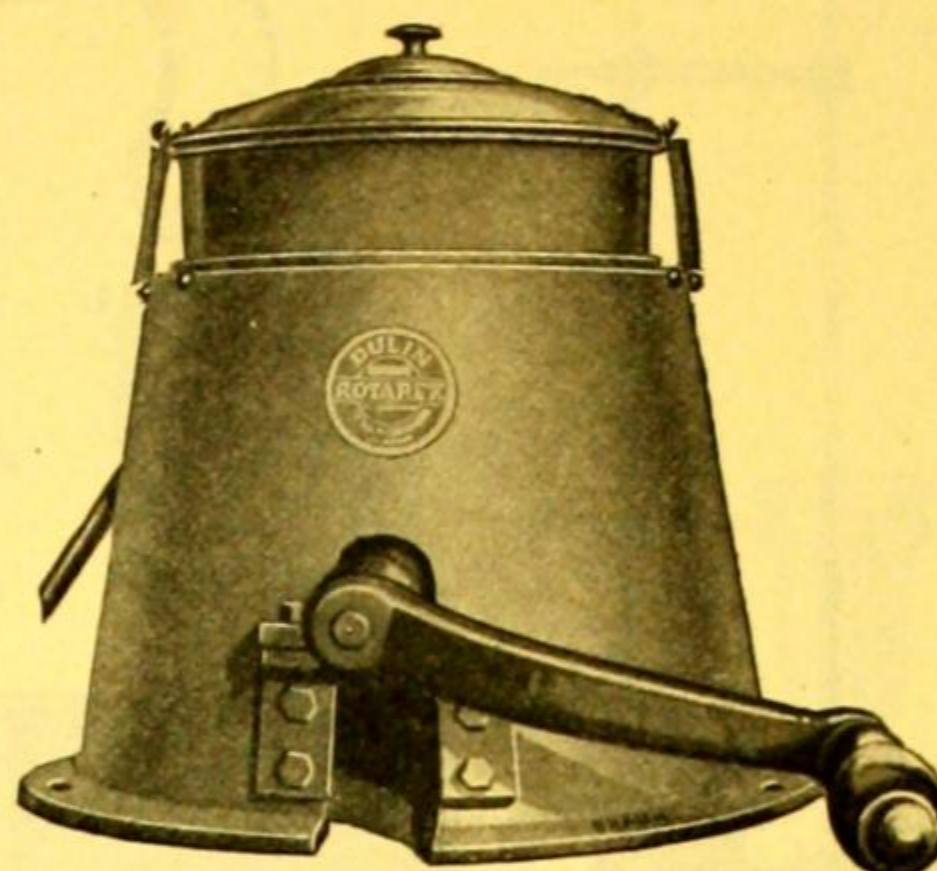
326. **ASBESTOS SLATE SQUARE**, 12x12x $\frac{1}{8}$ in. Superior to an asbestos pad.40



No. 332A.



No. 338.



No. 339.

APPARATUS FOR TESTING ASPHALT, CREOSOTE OIL, PITCH AND COAL TAR.

332A. BALL AND RING APPARATUS, American Society for Testing Materials type, for the determination of softening points of bituminous materials other than tar products. The apparatus consists of a 600 cc Pyrex glass beaker, a brass ring $\frac{5}{8}$ inch inside diameter and $\frac{1}{4}$ inch deep, with $\frac{3}{32}$ inch walls, and with brass wire handle attached; a steel ball $\frac{3}{8}$ inch in diameter weighing between 3.45 and 3.55 grams; a standard thermometer reading from 0° to 80° C. in $\frac{1}{5}^{\circ}$ divisions; and a rubber stopper and clamp for supporting the thermometer and ring. Complete with directions for use. (See A. S. T. M. Standard Specifications for 1921, No. D36-21.)

..... \$12.00

Note: Unless otherwise specified the thermometer with range from 0° to 80° C. will be furnished with the apparatus. For Bituminous Materials having softening points above 80° C, specify No. 13587 Thermometer with range from 30° to 160° C. in $\frac{1}{2}^{\circ}$ divisions.

13586. THERMOMETER, only for No. 332A, solid stem, engraved scale, graduated from 0° to 80° C. in $\frac{1}{5}^{\circ}$ divisions 8.00

13587. THERMOMETER, solid stem, engraved scale, graduated from 30° to 160° C. in $\frac{1}{2}^{\circ}$ divisions, for melting points of bituminous materials having softening points above 80° C. 5.00

335. BALLS, only for No. 332A. each .20
per dozen 2.00

336. RING, with wire handle attached for No. 332A 1.75

338. CENTRIFUGAL EXTRACTOR, Dulin Rotarex, No. 1, Motor Driven, capacity 50 grams, for the extraction of bituminous aggregates. Will give complete extraction in ten minutes. The large size sample insures greater accuracy in the analysis of coarse aggregates and will also extract enough bitumen to be used for tests on the asphaltic cement. Consists essentially of a 110 volt A. C. or D. C. motor mounted vertically on a cast iron base, directly connected to the aluminum extraction bowl. The bowl is surrounded by a cylindrical aluminum shell, shaped to drain through a spout at the side. The solvent is introduced into the extraction bowl through the funnel shaped screw which holds the filter ring and cover in place. The outer cover is made in two pieces so that the section immediately over the funnel may be removed when the solvent is added. Complete with rheostat, cord with plug for attaching to lamp socket, and directions for operating. (See Bulletin No. 314 of the U. S. Bureau of Public Roads) 95.00

Note: The above machine may be obtained with 100 gram bowl at a slightly increased price.

338D. FILTER RINGS, only for 50 gram Bowl. per 100 2.25

338H. FILTER RINGS, only for 100 gram Bowl. per 100 2.75

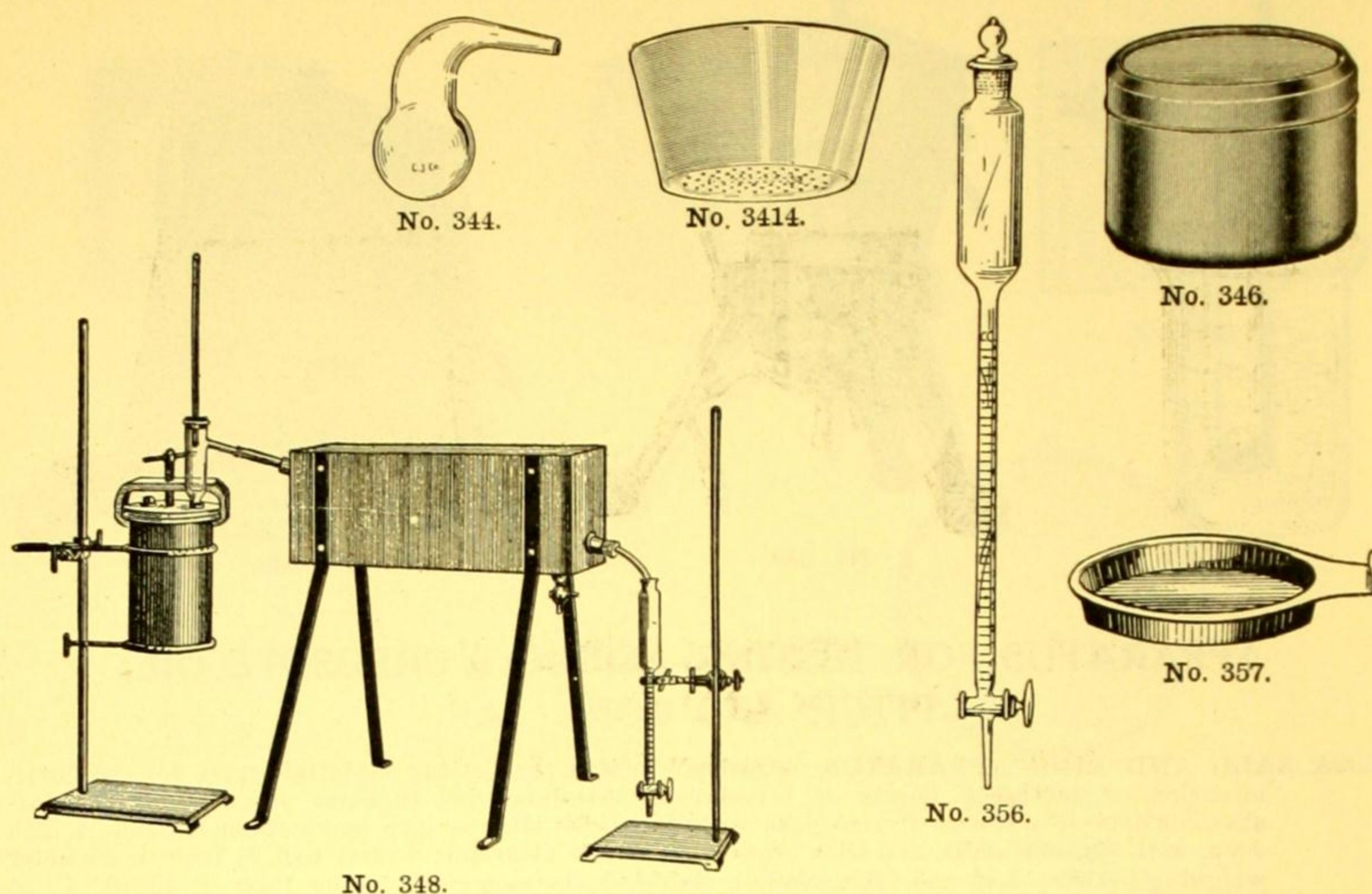
339. CENTRIFUGAL EXTRACTOR, Dulin Rotarex, Hand Power, capacity 50 grams, designed to meet the requirements for an extractor for field work. Similar in design to the motor driven machines, except that it is driven by a hand crank through a set of hand-fitted machine-cut gears so that a high speed can be maintained without vibration.

Note: The above machine may be obtained with 100 gram bowl at a slightly increased price.

FILTER RINGS for No. 339, see No. 338D.

340. CENTRIFUGAL EXTRACTOR, Dulin Rotarex No. 2, Motor Driven, capacity 1000 grams, with direct drive vertical type motor for 110 volts A. C. or D. C., enclosed in cast iron frame. Complete with rheostat, cord with plug for attaching to lamp socket, and directions for operating. 185.00

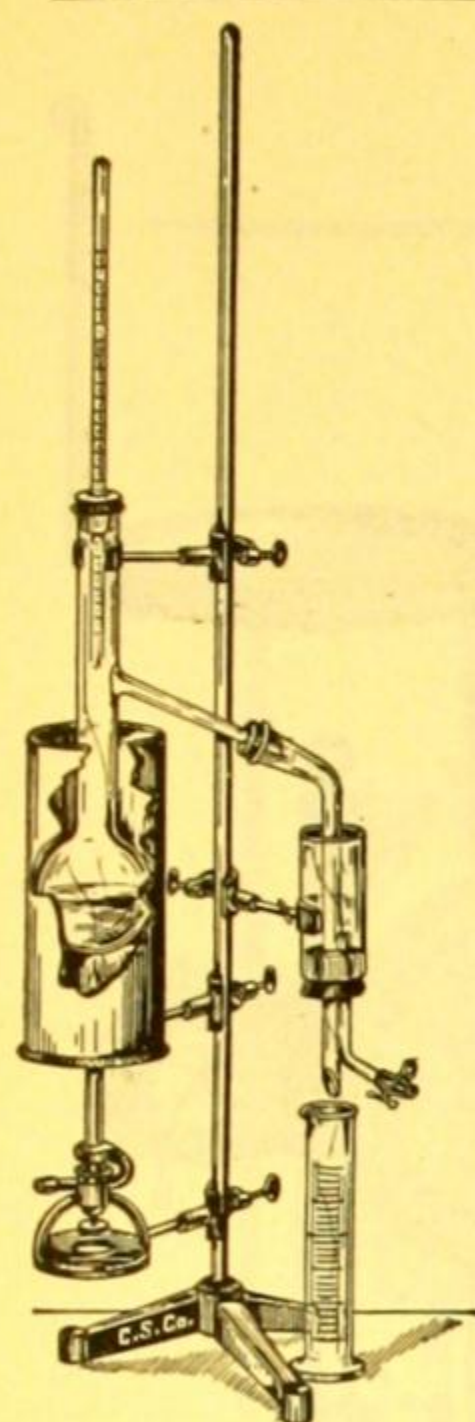
340D. FILTER RINGS, only for 1000 gram Bowl. per 100 5.50



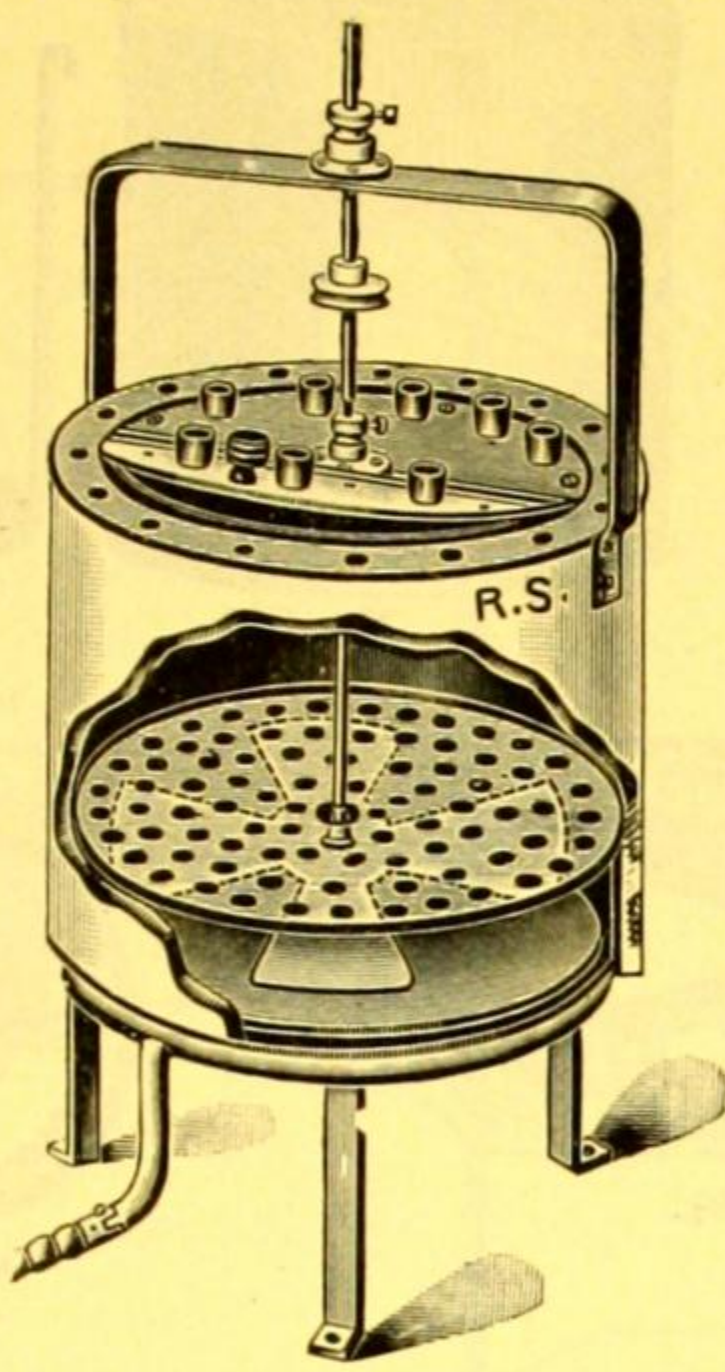
344. **COKE BULB**, Pyrex glass, as adopted by the American Society for Testing Materials, for coke test of asphalt, pitch and creosote oils. (See A. S. T. M. Specifications for 1921, No. D38-18) \$0.20
3414. **CRUCIBLE**, Gooch, Coors porcelain, of special form with large filtering surface for **Determining Bitumen Soluble in Carbon Bisulphide**. Height, 24 mm; outside diameter at bottom, 35 mm; outside diameter at top, 45 mm; capacity, 30 cc. (See Specifications of the A. S. T. M. for 1921, No. D4-11)60
346. **CUPS OR SAMPLE BOXES**, for asphalt, of tin plate, as recommended by the American Society for Testing Materials, in Standards for 1921, No. D6-20, page 732. Diameter about $2\frac{3}{16}$ inches; depth, about $1\frac{3}{8}$ inches per dozen .60
348. **DEHYDRATING APPARATUS**, for Dehydrating Tars, and other Bituminous Materials, and for the analysis of **Water in Creosote Oils and Bituminous Materials** according to the Standards of the American Society for Testing Materials. Consists of a cylindrical copper still 15.8 cm high and 9.5 cm in diameter, supported on an iron stand and fitted with a lid provided with clamp and thumb screw. The condenser consists of a copper jacket 38.75 cm long with inner glass condenser tube set at an angle of 75°. A special combined separatory funnel and burette is furnished, with a capacity of 120 cc with outlet tube graduated in $\frac{1}{5}$ cc divisions. Complete as illustrated, with copper still, connecting tube, ring burner of brass, condenser box, glass condenser tube, separatory funnel, supports and clamps, **but without thermometer**. (See A. S. T. M. Specifications for 1921, No. D38-18, page 808; A. S. T. M. Tentative Specifications for 1921, No. D114-21T; and Bulletin 314 of the U. S. Bureau of Public Roads) 38.50
13626. **THERMOMETER** for No. 348, graduated from 0° to 400° C. in 1° divisions according to the requirements of the American Society for Testing Materials 7.00

Extra Parts for No. 348.

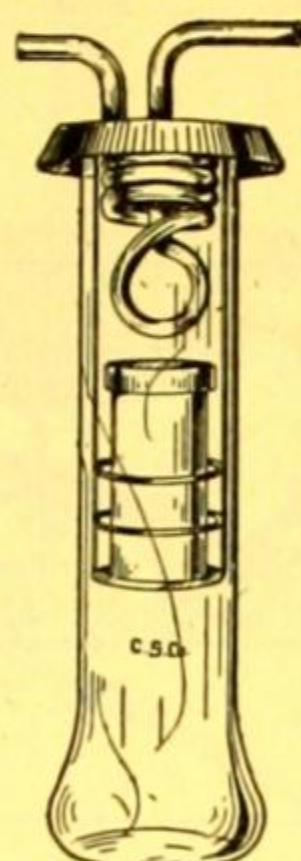
351. **COPPER STILL**, with cover, clamp and thumb screw, with tubulature for connecting tube and with 6 paper gaskets. Height inside 15 cm; diameter 8.7 cm 20.00
352. **RING BURNER**, of brass, for use with No. 351 2.50
353. **CONNECTING TUBE**, of glass, with side arm35
354. **CONDENSER**, of copper, on support, with inner condenser tube 8.00
355. **INNER CONDENSER TUBE**, for No. 354, of glass, about 60 cm long40
356. **SEPARATORY FUNNEL**, with stopcock, capacity 120 cc, with outlet tube graduated in $\frac{1}{5}$ cc divisions 4.50
357. **DISH**, Evaporating, for use in evaporation test, of pure nickel, with flange and handle 2.10



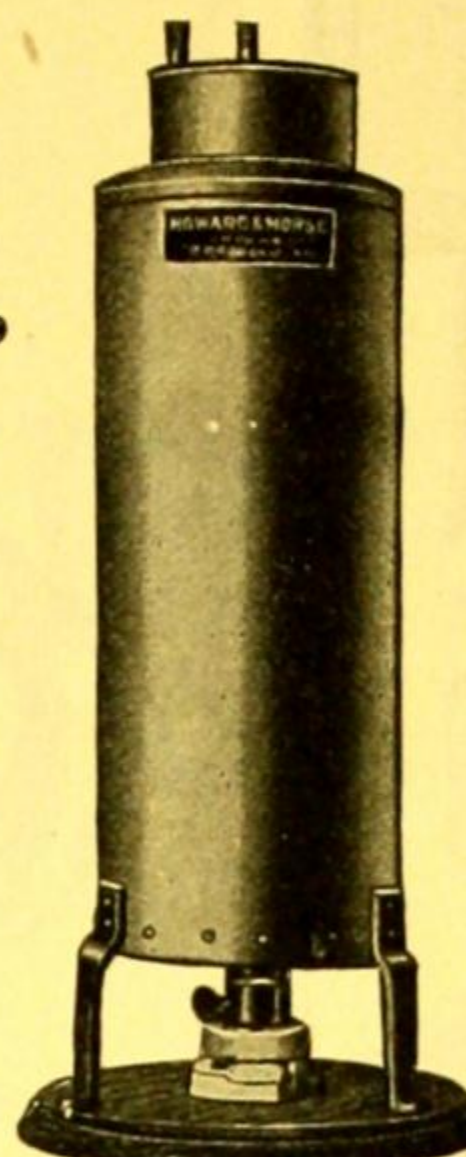
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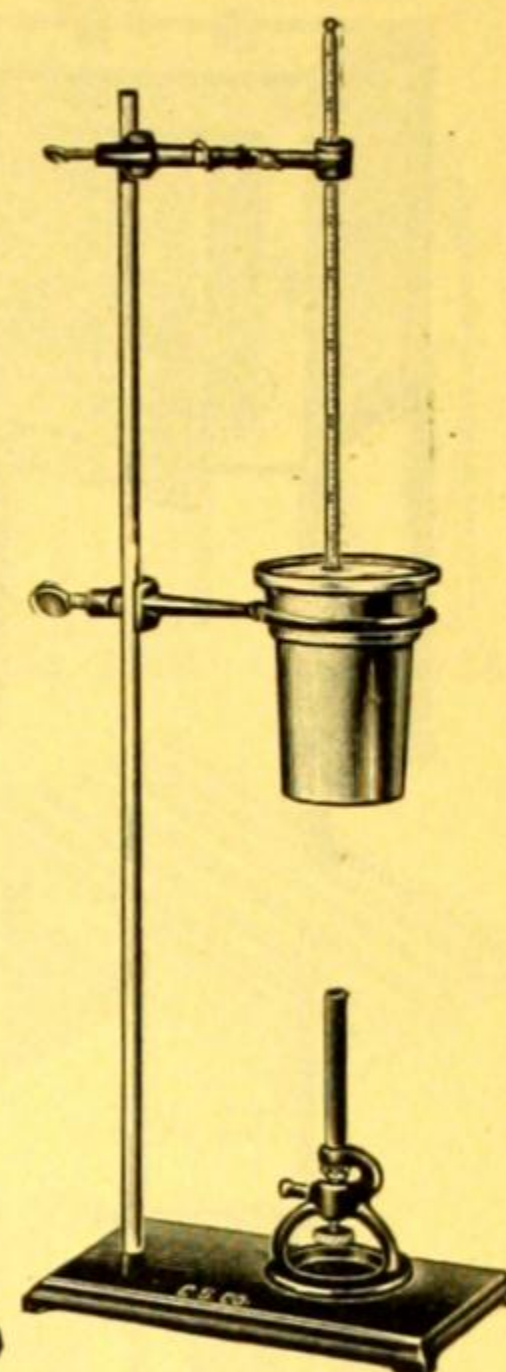
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No. 366.

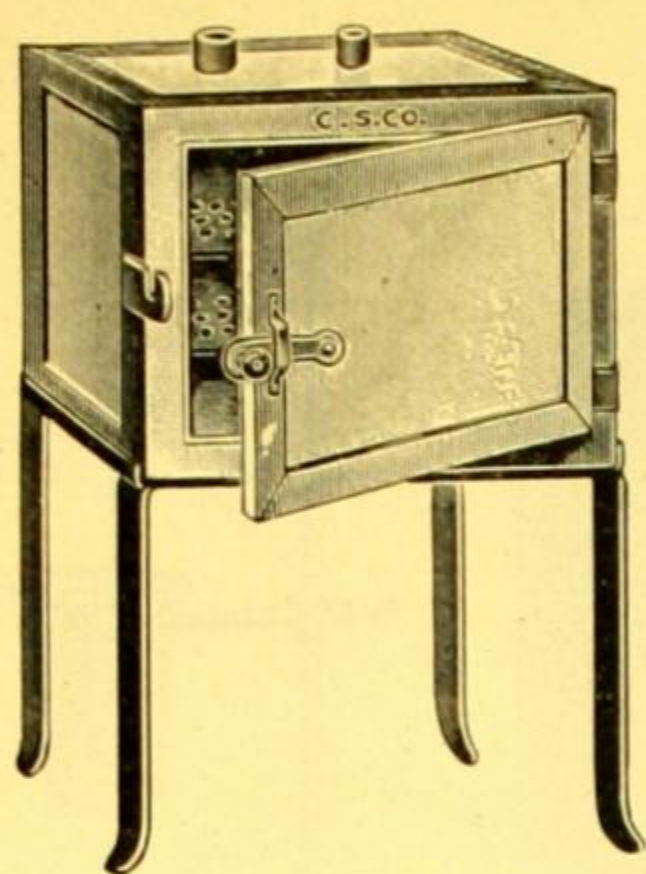


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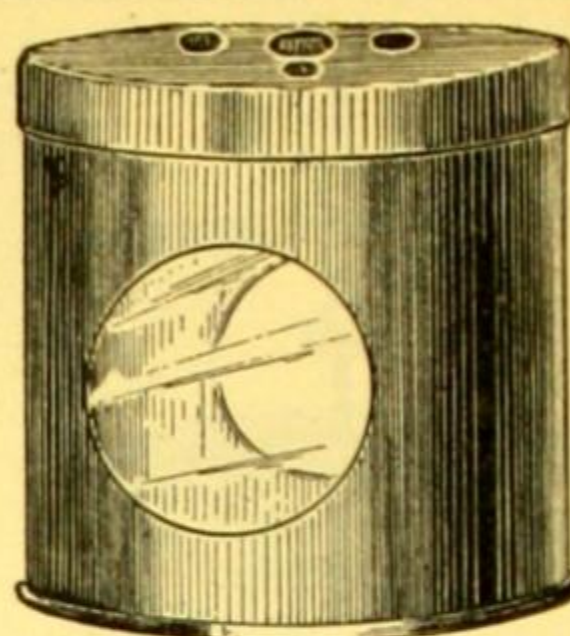


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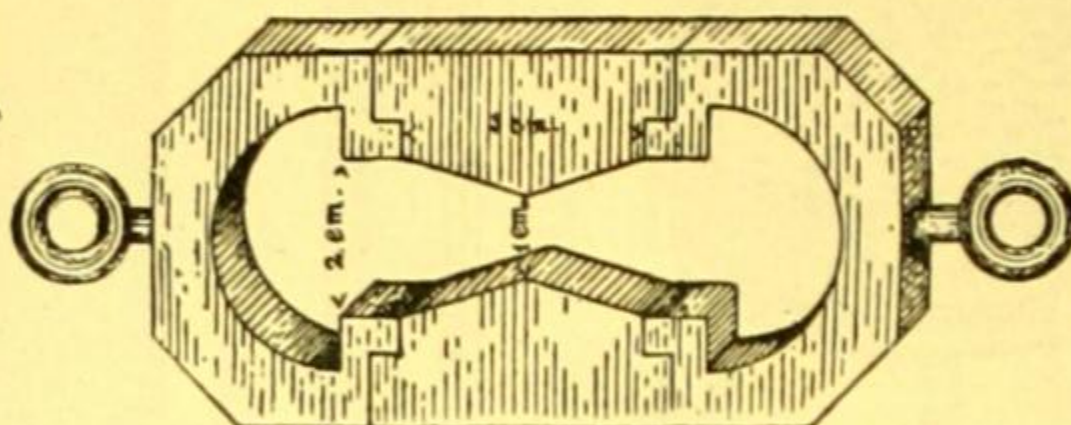
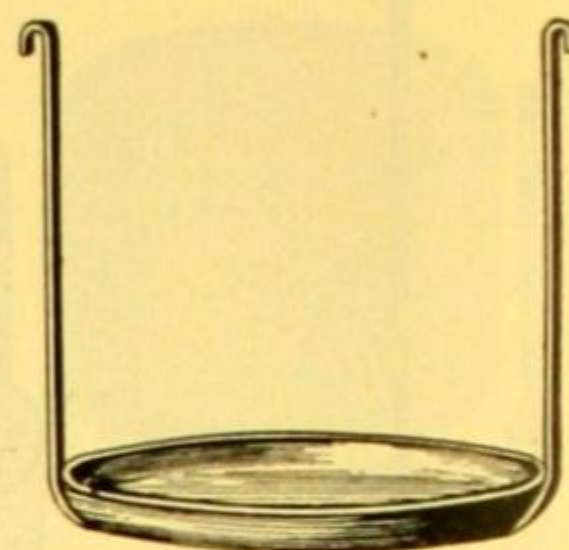
358. **DISTILLATION APPARATUS**, for Tars, American Society for Testing Materials Type, consisting of a 250 cc Pyrex Engler flask supported on a ring stand and surrounded by a metal shield with sight hole. The side arm is connected by a rubber stopper to a special type of condenser. Complete with flask, shield, condenser, 25 cc graduate, support stand, two clamps and 4 inch ring, but without burner or thermometer. (See A. S. T. M. Standard Specifications for 1921, No. D20-18, for the "Distillation of Bituminous Materials Suitable for Road Treatment"; and Bulletin 314 of the U. S. Bureau of Public Roads) \$8.50
5624. **FLASK**, only for No. 358, Pyrex glass, actual capacity 250 cc, rated capacity 200 cc.... .65
- THERMOMETER** for No. 358, see No. 13626.
360. **DRYING OVEN**, New York Testing Laboratory Type, of Russia iron, double walled, covered with asbestos. The heat is supplied by a 10 inch ring burner immediately beneath the air space between the two walls. The interior of the oven is provided with a perforated shelf, beneath which is a fan for insuring even temperature. The door is hinged and provided with openings for thermometer, thermoregulator, etc. Height, 20 inches; diameter, 11 inches. Without thermometer and thermoregulator. (See American Society for Testing Materials Standards for 1921, No. D6-20 for "Loss on Heating of Oil and Asphaltic Compounds.")..... 36.00
13512. **THERMOMETER**, only for No. 360, solid stem, engraved scale, graduated from 150° to 175° C. in 1° divisions. Length, about 6 inches; scaled for total immersion..... 5.00
- 9830B. **DRYING OVEN**, DeKhotinsky, Electrically Heated and Regulated, used for the test for loss on heating of oil and asphaltic compounds, constructed to produce such a uniform temperature of drying space as to preclude the necessity for a rotating shelf. For details of construction and price see No. 9830B under general heading **Ovens, Drying**.
366. **EXTRACTION APPARATUS**, American Society for Testing Materials type, for matter insoluble in benzol in analysis of creosote oil and for free carbon in tars and pitches. Consists of a flask of special form, and wire support for filter cup. (See A. S. T. M. Standard Specifications for 1921, No. D38-18, page 808, "Sampling and Analysis of Creosote Oil"; and Journal of Industrial and Engineering Chemistry, Vol. VI, No. 4, for April 1914, page 279, "Free Carbon Determination in Tars and Pitches")..... 4.15
- 366A. **FLASK**, only, of No. 366..... 1.00
- 366B. **WIRE SUPPORT**, only, of No. 366..... .80
- 366C. **CONDENSER**, only, of No. 366, of block tin with cover attached..... 2.35
- 366D. **ALUNDUM THIMBLES** for No. 366, of RA98 porous alundum, height 88 mm; diameter, 30 mm; with flat bottom..... .75
368. **EXTRACTION APPARATUS**, New York Testing Laboratory Type, for the extraction of bituminous material from paving mixtures containing broken stone. Consists of a metal cylinder, inside which fits a second cylindrical metal vessel which holds the solvent. A wire basket holding 500 grams of the disintegrated paving material is suspended in the inner vessel, and an inverted conical condenser provided with outlets for water circulation is placed in the top. The heat is supplied by a 16 C. P. incandescent lamp, mounted on the wooden base and projecting into the bottom of the outer cylinder. With 175 to 200 cc of carbon disulphide, 500 grams of sample should extract clean in three hours. Complete, without lamp bulb..... 55.00
370. **FLASH POINT TESTER**, Elliott or New York State Board of Health Type, as modified by the Underwriters Laboratories, with Bunsen burner and with Thermometer No. 13444A, graduated from 200° to 750° F..... 10.00
- For other Flash Point Testers, see Oil Testing Section.



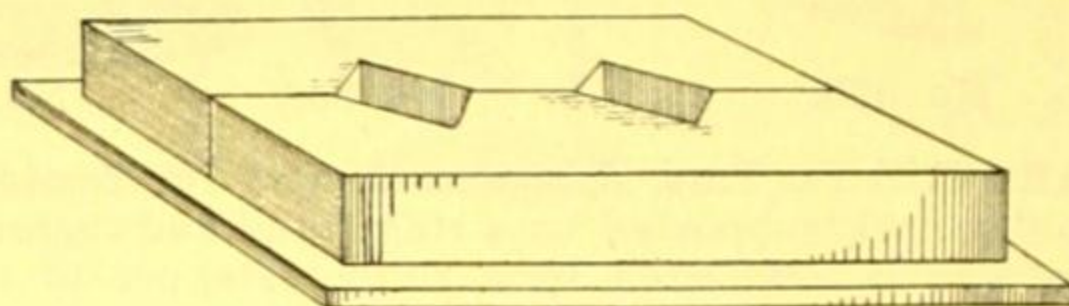
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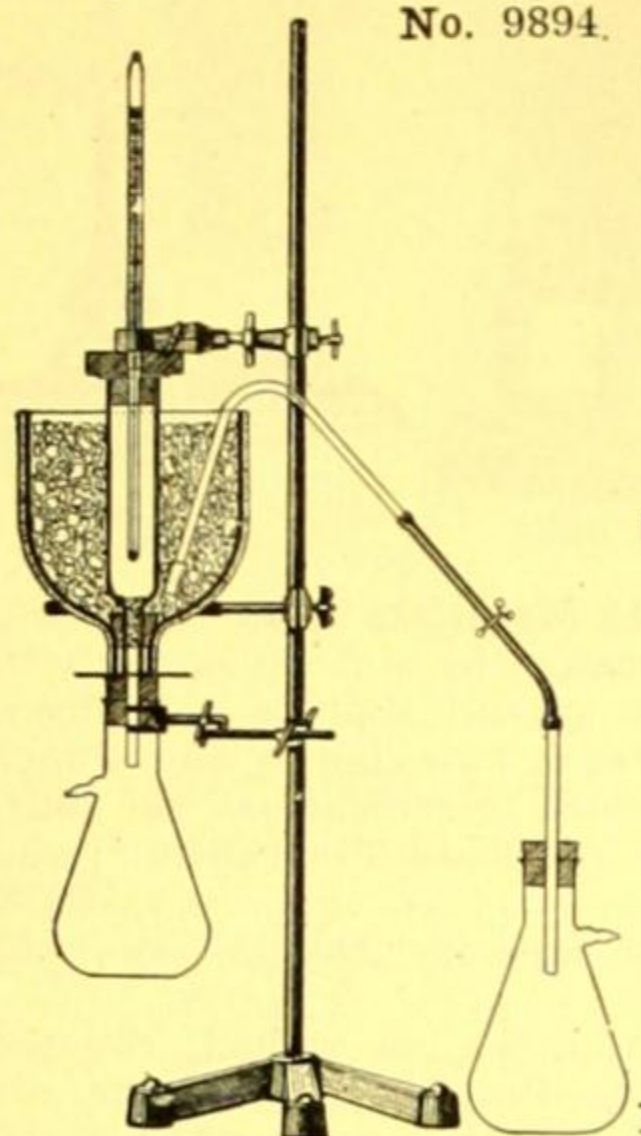
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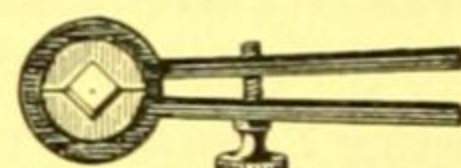
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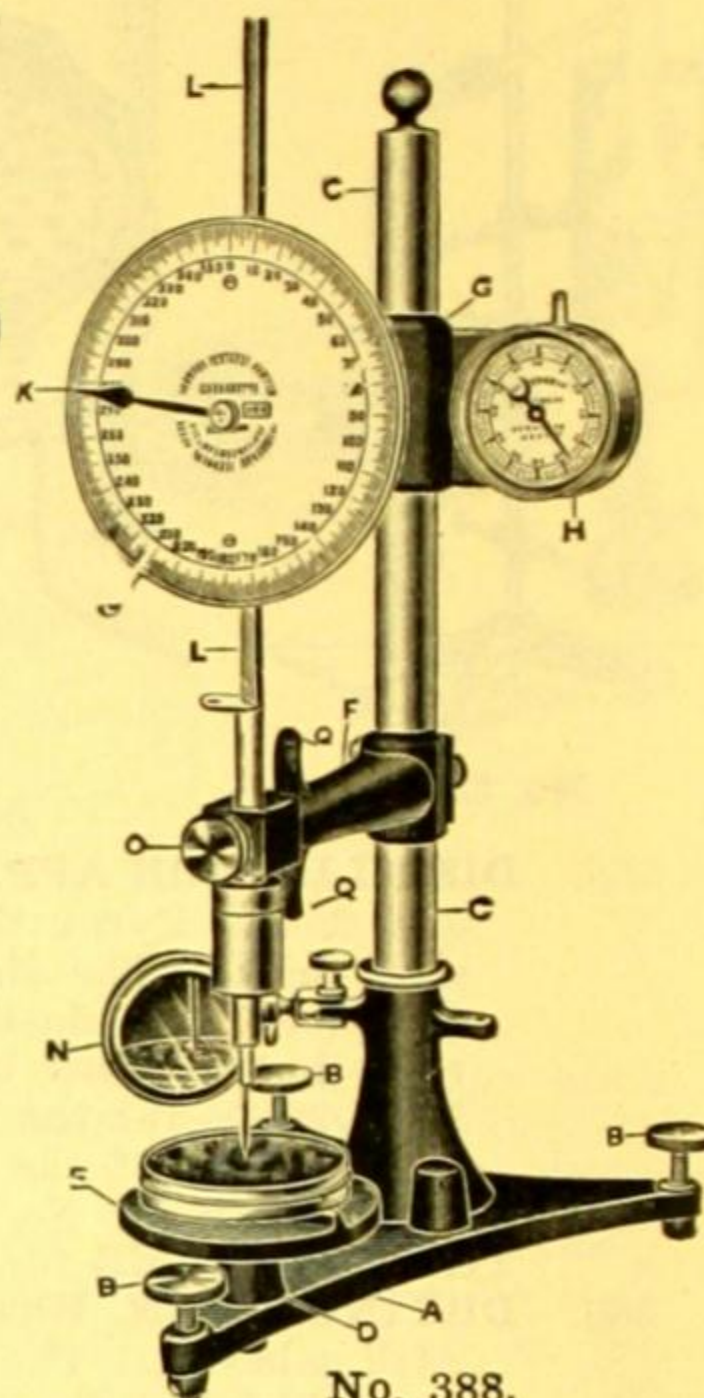
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No. 374.

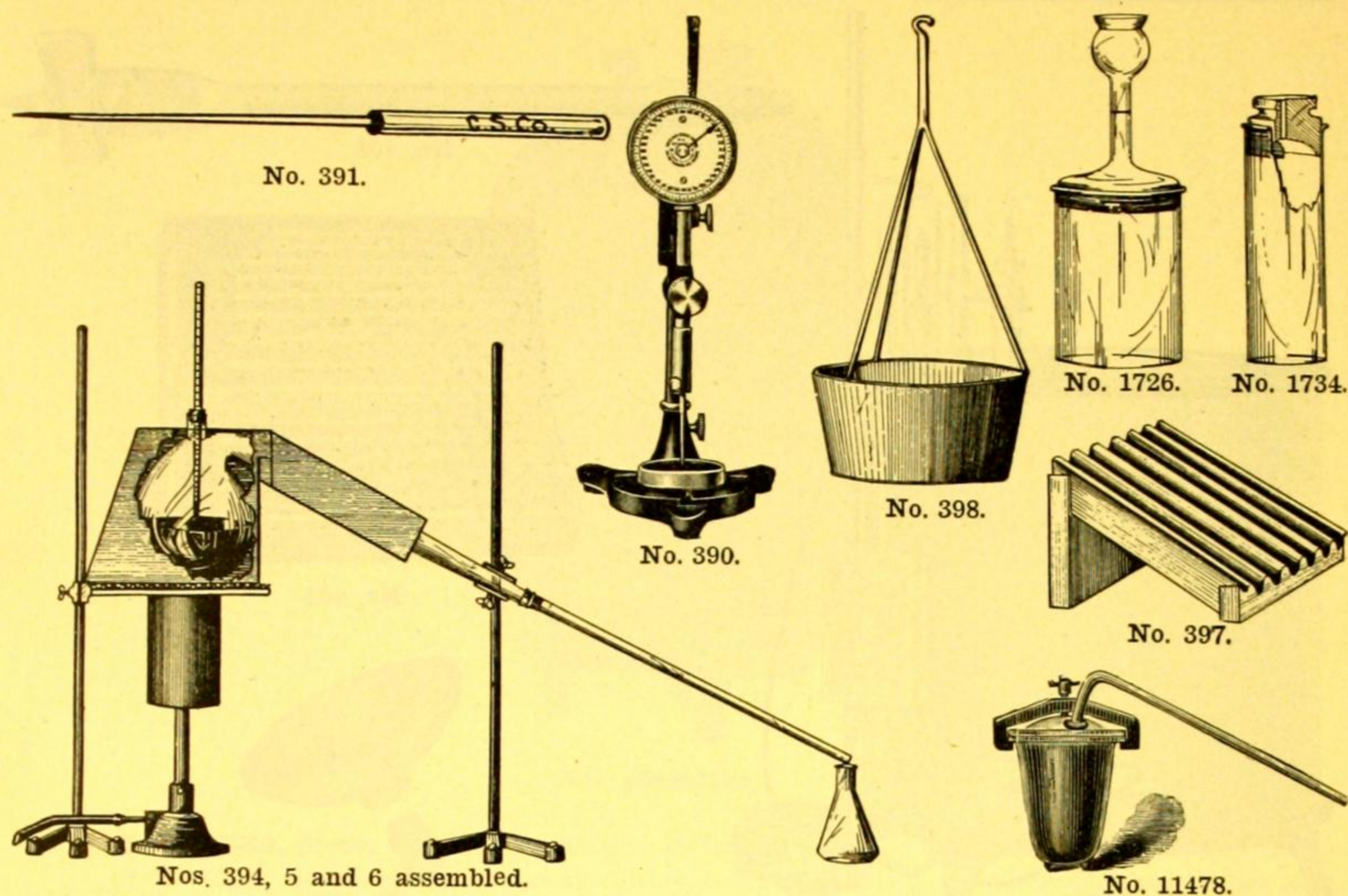


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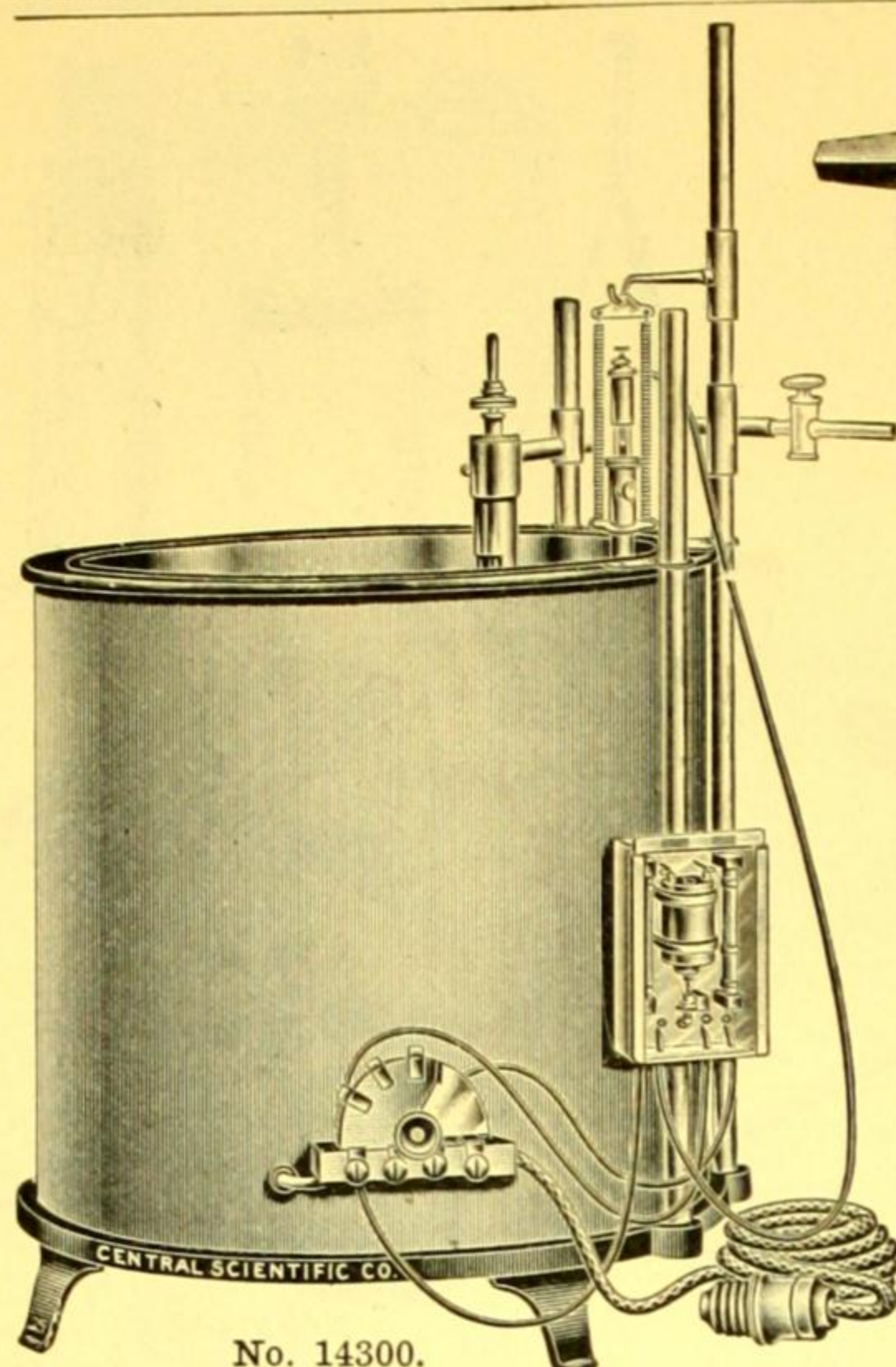


No. 388.

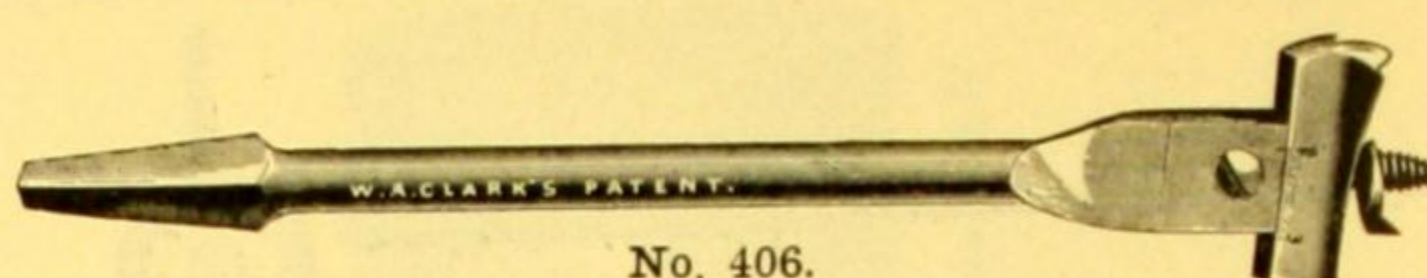
374. **FREEZING APPARATUS**, designed by Prevost Hubbard of the United States Bureau of Public Roads, for determining the percentage of paraffine scale in bituminous materials. Consists of an inverted bell jar surrounded by a cover of felt. A copper jacket is held in the neck of the bell jar by a rubber stopper. A glass filter tube wrapped with blotting paper fits inside the copper jacket, and extends through the rubber stopper which fits into the 500 cc filter flask. Complete with support stand, clamps, bell jar, two 500 cc filter flasks, rubber stopper, etc., as illustrated, but **without thermometer**. (See Bulletin No. 314, of the U. S. Bureau of Public Roads) \$14.00
- HYDROMETERS**, see general heading **Hydrometers**.
- HOT PLATES**, Electric or Gas, see under general heading **Hot Plates**.
381. **MOLD, Asphalt Briquette, American Society for Testing Materials Type**, of brass, with removable center pieces, for use in the test for ductility of bituminous materials. (See A. S. T. M. Tentative Specifications for 1921, No. D113-21T) 7.50
382. **MOLD, Cube**, of brass, for one-half inch cubes, with iron clamp. For use in molding cubes for the cube-in-water method for melting point of bituminous road materials. (See Bulletin 314, of the U. S. Bureau of Public Roads) 6.00
383. **MOLD, Cube, American Society for Testing Materials Type**, of brass, for one-half inch cubes, with iron clamp. For use in molding cubes for the cube-in-water method for softening point of tar products. (See A. S. T. M. Specifications for 1921, No. D61-20) 5.25
9894. **OVEN, Drying, Single Wall**, of copper covered throughout with asbestos, as used in tar and pitch testing. Size, 8x10x8 inches 30.00
384. **OVEN, Melting Point, or Air Bath, Barrett Type**, for the determination of the melting point of tar. Consists of a copper cylinder with observation window of mica. Inner vessel of copper can be removed for cleaning 10.00
- Ovens, Drying and Constant Temperature**, see under general heading **Ovens**.
388. **PENETROMETER, Standard, New York Testing Laboratory Type**, provided with a stop-clock for timing the duration of the test by half second beats, and with dial graduated in 360 degrees, each of which represents 1/10 mm of penetration. With adjustable weights for loads of 50, 100 and 200 grams, leveling screws, adjustable platform and adjustable mirror for lighting the specimen. (For full description, see Richardson "The Modern Asphalt Pavement," page 565; for "Standard Method of Test for Penetration of Bituminous Materials," see A. S. T. M. Specification for 1921, No. D5-21) 100.00



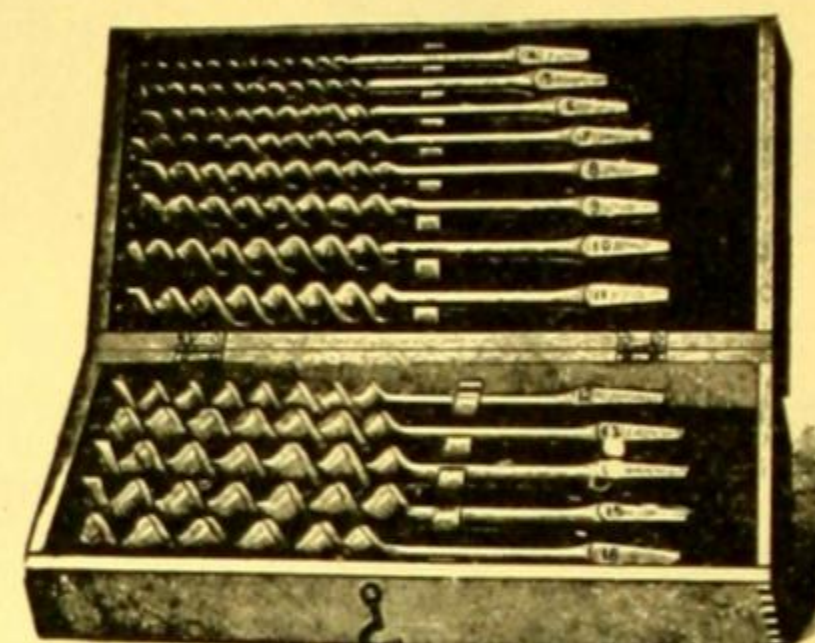
390. **PENETROMETER**, Miniature, for portable work, about half the size of the standard instrument. Combined weight of chuck and needle, 100 grams. Without clockwork..... \$50.00
391. **PENETRATION NEEDLE**, American Society for Testing Materials Type, originally designed by Charles S. Reeve and Fred P. Pritchard of the Bureau of Public Roads of the United States Department of Agriculture and modified by the American Society for Testing Materials in co-operation with the Bureau of Public Roads. This needle gives the same results as the old standard No. 2 Cambrie needle, and possesses the advantage that it can be exactly duplicated and accurately described. With brass ferrule to facilitate holding in the chucks of standard penetrometers. (See A. S. T. M. Standard Specifications for 1921, No. D5-21; and Bulletin 314 of the U. S. Bureau of Public Roads)..... 1.00
394. **RETORT**, Tubulated, of Pyrex Glass, American Society for Testing Materials Type, for the Distillation of Creosote Oil. Capacity about 250 cc; length of condenser tube, about 30 cm. (See A. S. T. M. Standard Specifications for 1921, No. D38-18 for "Sampling and Analysis of Creosote Oil")..... 1.90
- THERMOMETER** for No. 394, see No. 13626.
395. **CONDENSER**, glass tube, for use with No. 394. Length about 36 cm..... .45
396. **SHIELD**, galvanized iron covered with asbestos, for use with No. 394, for protection from air currents..... 3.00
11478. **RETORT**, Iron, for the distillation of bituminous materials in preparation for determination of paraffine scale by the "freezing-out" method. The 250 cc retort is recommended for standard tests. (See Bulletin No. 314 of the U. S. Bureau of Public Roads.) Also used in the test for moisture in creosoted wood block in connection with No. 356 separatory funnel. (See Hubbard's "Highway Inspectors' Handbook".)
- | | | | | |
|-------------------|------|------|------|------|
| Capacity, cc..... | 250 | 500 | 1000 | 2000 |
| Each | 3.80 | 4.50 | 5.00 | 6.00 |
- SIEVES**, for the grading of Mineral Aggregate, see No. 12124 under general heading Sieves.
397. **SLIDE BOX**, Barrett Type, of copper with six corrugations, for slide test of pitch..... 5.00
398. **SPECIFIC GRAVITY PAN**, American Society for Testing Materials Type, of nickel, for determining the specific gravity of solid and semi-solid fractions of creosote oil. Diameter of top, 2.5 cm; depth, 1.2 cm. With hook for attaching to balance. (See A. S. T. M. Standard Specifications for 1921, No. D38-18, "Sampling and Analysis of Creosote Oil")..... 1.25
1726. **BOTTLE**, Specific Gravity, Barrett Type, 50 cc capacity, for specific gravity of tar and pitch. (See Journal of Industrial & Engineering Chemistry, Vol. V, No. 3, for March 1913, page 195)..... 1.60
1734. **BOTTLE**, Specific Gravity, Hubbard, for fluid and semi-solid bitumen, designed by Prevost Hubbard of the Office of Public Roads. Consists of a heavy tube 70 mm long and 22 mm inside diameter, with accurately ground stopper made concave on under side. A hole 1.6 mm in diameter passes through stopper and connects with this hollow space, permitting air to escape easily. Capacity, about 24 cc; weight empty, about 28 grams. (See Bulletin 314 of the U. S. Bureau of Public Roads and A. S. T. M. Tentative Specifications for 1921, No. D70-20T) 1.50



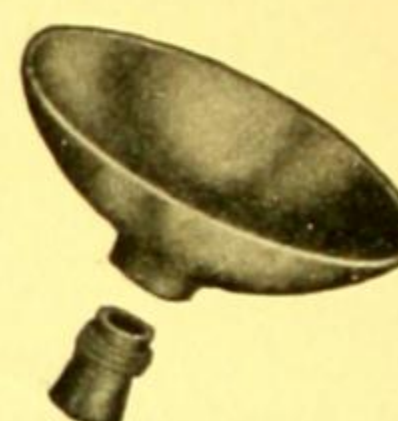
No. 14300.



No. 406.



No. 404.



No. 400.

VISCOSIMETER, Engler, for viscosity determination of bituminous materials, see under general heading **Viscosimeters**.

400. **VISCOSIMETER OR FLOAT TESTER**, American Society for Testing Materials Type, for the viscosity or float test of bituminous binders including creosote oil residues. Consists of a concave aluminum float, 3½ inches inside diameter, and a brass collar which screws into the base of the float. Complete with two extra brass collars. (See A. S. T. M. Standard Specifications for 1921, No. D38-18)..... \$9.50

- 400A. **COLLARS**, only of No. 400, of brass..... each 2.00

401. **PLATE**, Brass, 5x8 cm, for use in filling the brass collar of No. 400..... .55

WATER BATH, DeKhotinsky, Electrically Heated and Regulated, for use in maintaining a constant temperature in the penetration and ductility tests of bituminous materials; also for use in any other laboratory work where constant temperature is necessary. It consists of a copper container, heavily nickel-plated inside and out, lagged with magnesia-asbestos, and protected outside by a sheet of Russia iron. The bath is attached to an enameled cast-iron base and supplied with three nickel-plated rods, to which may be attached laboratory clamps for supporting flasks, etc. Each bath is fitted with four electric heating units, three of which may conveniently be added one by one, by means of the switch constituting part of the bath. The fourth unit is electrically connected to the relay, which is automatically operated by a thermoregulator. A constant water level attachment is furnished with each bath, by means of which the water level can be regulated. The bath has a very good natural circulation as heat is supplied inside the bath 25 mm from the bottom. When experiments or tests require a more vigorous circulation and regulation closer than 1/10° C., a small High Speed Turbine Stirrer No. 12864 can be attached to the bath. Complete with four heating units, relay, thermoregulator, constant water-level device, support rods, five feet of cord and attachment plug, but without stirrer. (For more complete description see No. 14300 under general heading **Water Baths**.)

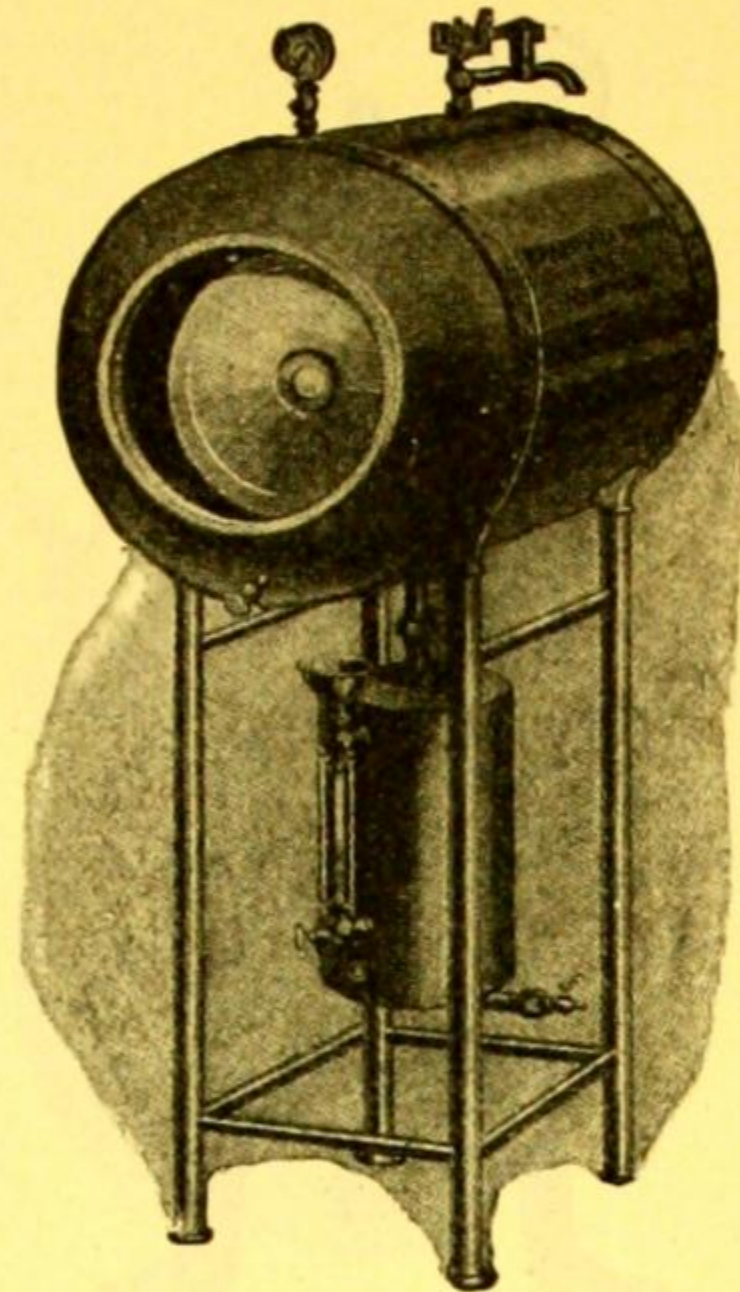
No.	A	B
Capacity, liters	9.3	18.25
Available height inside, cm.	25.0	30.5
Diameter inside, cm.	19.	25.
14300. For 110 volts A. C.	125.00	135.00
14301. For 220 volts A. C.	125.00	135.00
14302. For 110 volts D. C.	125.00	135.00
14303. For 220 volts D. C.	125.00	135.00

Note:—In ordering state mean temperature desired so that heating units of correct wattage may be furnished.

WATER BATHS, steam or gas heated, see under general heading **Water Baths**.

ATOM MODELS, see **Models**.

404. **AUGER BITS**, set of 13 high grade bits in hardwood case; ¼ to 1 inch by sixteenths of an inch. 8.00
406. **AUGER BIT**, Clark's adjustable expansion bit, cutting from ½ inch to 1½ inches..... 2.00



Nos. 408A-410A.

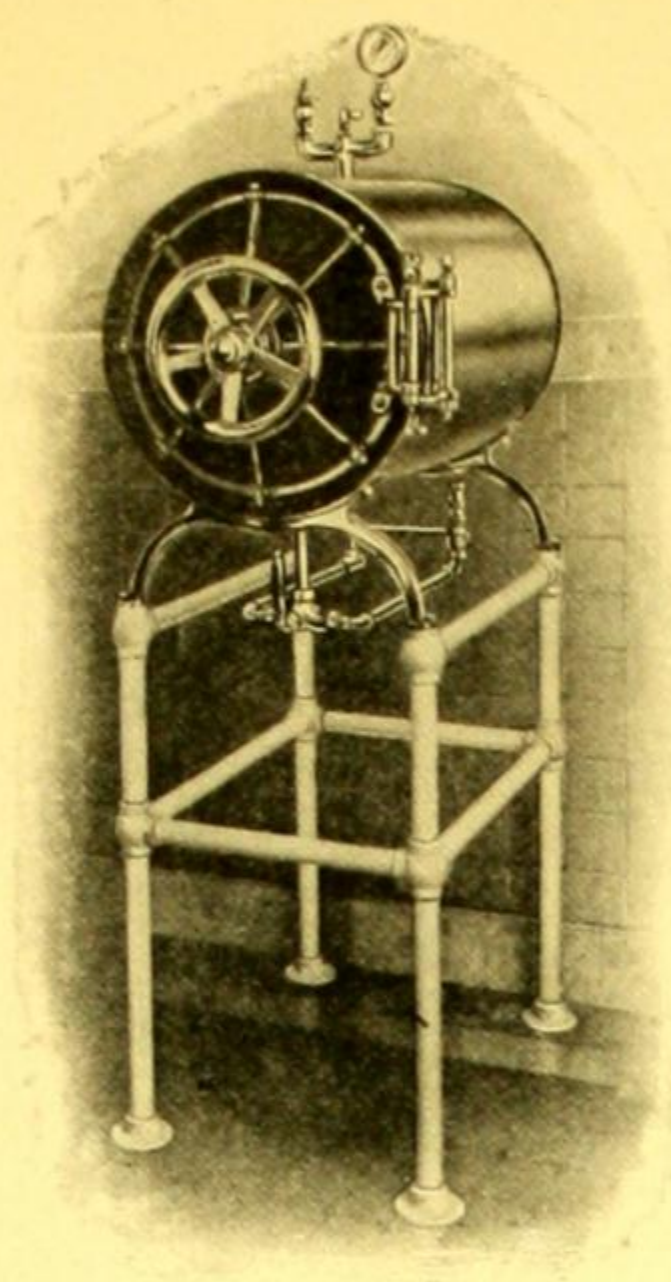
AUTOCLAVES, Steam Pressure Sterilizers, horizontal form, double wall, for rapid sterilization of dressings, laboratory apparatus or culture media. Constructed of heavy polished copper with double wall and with detachable steam generator, which eliminates any danger of burning out the sterilizer should the water be entirely used up. Mounted on a substantial iron stand which can be permanently fastened to the floor. The circular door, made of solid cast brass, is quickly and easily opened, rolling back on a track inside the sterilizer. The door and head are perfectly ground and fitted, requiring no packing or gaskets to make a steam tight joint. No clamps or springs are required to hold the door shut, as it cannot be opened if the least steam pressure remains in the chamber, thus eliminating the danger of scalding. The steam enters, circulates around the inner jacket and is then admitted to the inner chamber through an automatic valve, the air being expelled through an air cock. The safety valve is set to relieve at 15 pounds pressure, at which pressure a temperature of 249° F. is obtained. At pressures of from 10 to 15 pounds, giving the corresponding temperatures of from 240° F. to 249° F., the most difficultly sterilized material is rendered completely sterile within 15 minutes. The autoclave may be used as a free steam sterilizer by leaving the air cock open, thus insuring a temperature of 212° F. inside of the inner chamber. The double wall sterilizer is recommended for all types of sterilizing such as bandages, dressings, instruments, laboratory utensils or culture media. If a sterilizer is required for sterilizing laboratory apparatus and culture media only, the double wall feature is not necessary. **Single wall sterilizers**, of the same construction, can be supplied at 15 per cent. less than the double wall.

AUTOCLAVES, double wall, complete as described with inner shelf, water gauge, safety valve, steam gage and steam generator; finished in burnished copper with brass fittings and substantial iron stand.

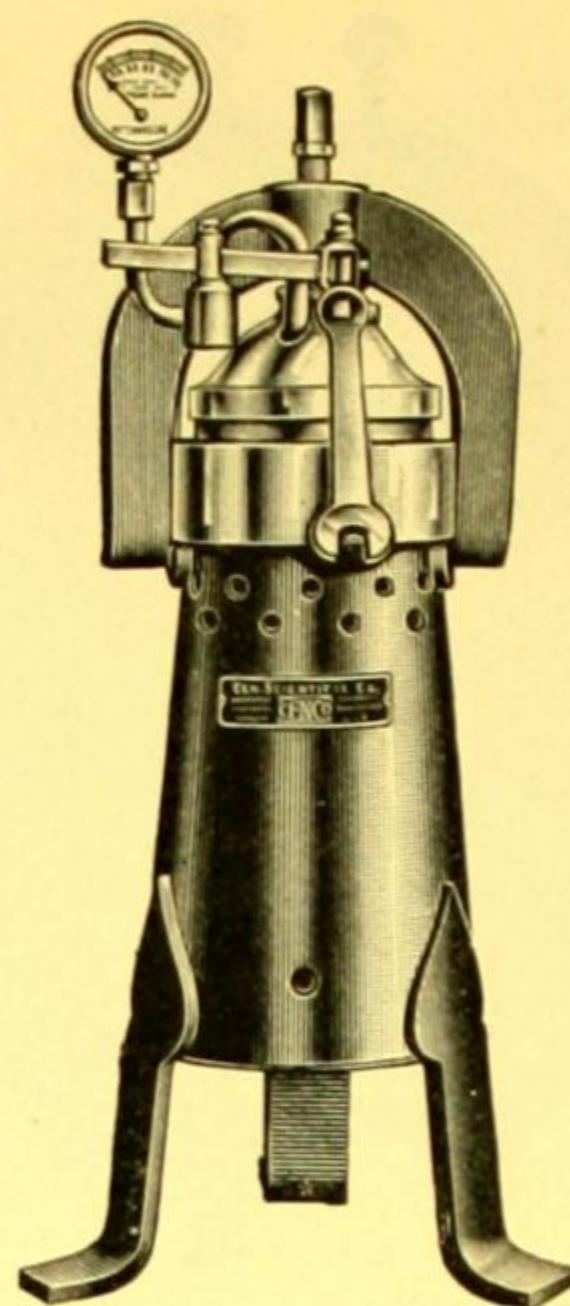
No.	0B	1B	2B	3B	4B
Length inside, inches.....	16	20	24	28	28
Diameter inside, inches.....	12	16	20	22	25
Diameter of door, inches.....	8	10	12	14	16
408A. Arranged for steam heat.....	\$180.00	220.00	262.00	313.00	416.00
409A. Arranged for gas heat.....	180.00	220.00	262.00	313.00	416.00
410A. Arranged for electric heat.....	208.00	254.00	305.00	364.00	467.00

Nickel-plated finish can be supplied, if desired, at an additional cost. Quotations will be made upon application.

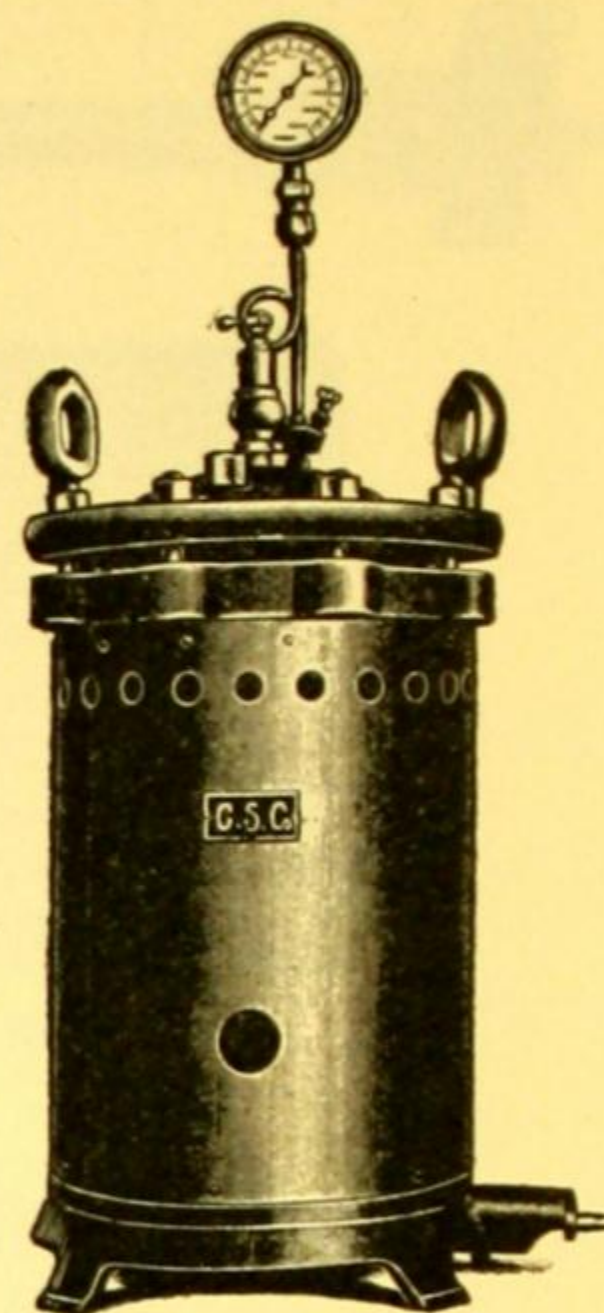
In ordering for electric heat, kindly state voltage and kind of current.



Nos. 412-415.



No. 419F.



No. 420.

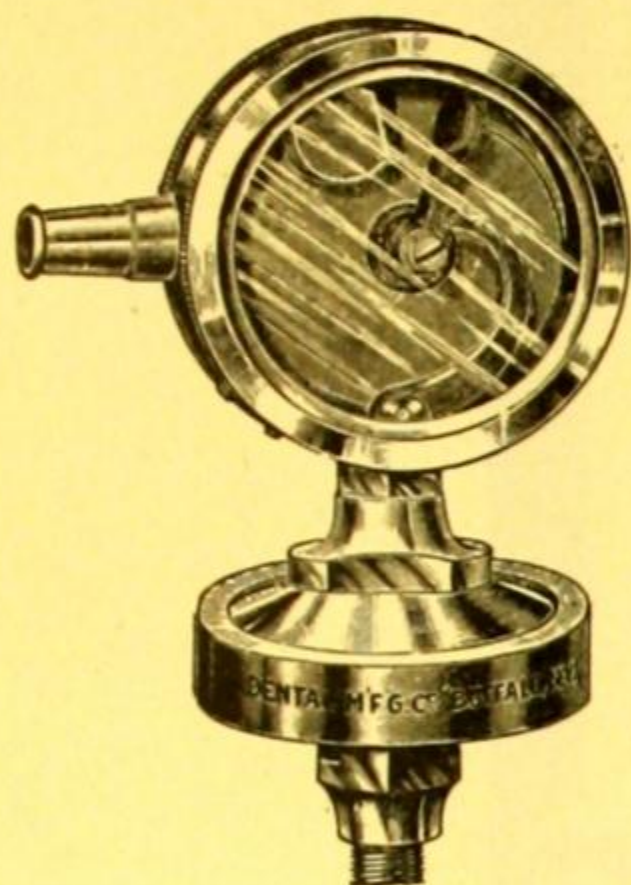
AUTOCLAVES, Steam Pressure Sterilizers, horizontal form, single wall, for the rapid sterilization of laboratory apparatus, culture media and solutions. The sterilizing chamber, cylindrical in form, is made of heavy sheet copper, enclosed by an efficient heat insulating covering held in place by a copper finishing jacket. The door is fitted with an automatic stop which guards against its being opened while there is steam pressure in the chamber. Articles to be sterilized are placed within the chamber, the door locked, and the steam turned on with the exhaust open until the steam has displaced all the air in the chamber, when the exhaust is closed. Steam pressure up to 15 pounds may then be maintained for the desired period; eight to ten minutes at 15 pounds pressure are considered ample. Materials employed throughout are the highest grade bronze, brass and copper. The interior of the chamber is carefully tinned and the exterior of the sterilizer is heavily nickel-plated and highly polished. The door, door frame and back end are finished in hand rubbed ebony enamel. Complete as described with safety valve, pressure gage, independent high power steam generator and all necessary operating valves; mounted on a white enameled tubular steel stand, fitted with cast brass floor plates.

	No.	B	C	D	E	F
	Length, inches	21	22	24	26	30
	Diameter, inches	11	14	16	18	22
412.	Arranged for steam heat.....	\$189.00	225.00	270.00	315.00	418.50
413.	Arranged for gas heat.....	211.50	247.50	292.50	342.00	450.00
415.	Arranged for electric heat.....	234.00	270.00	315.00	360.00	495.00

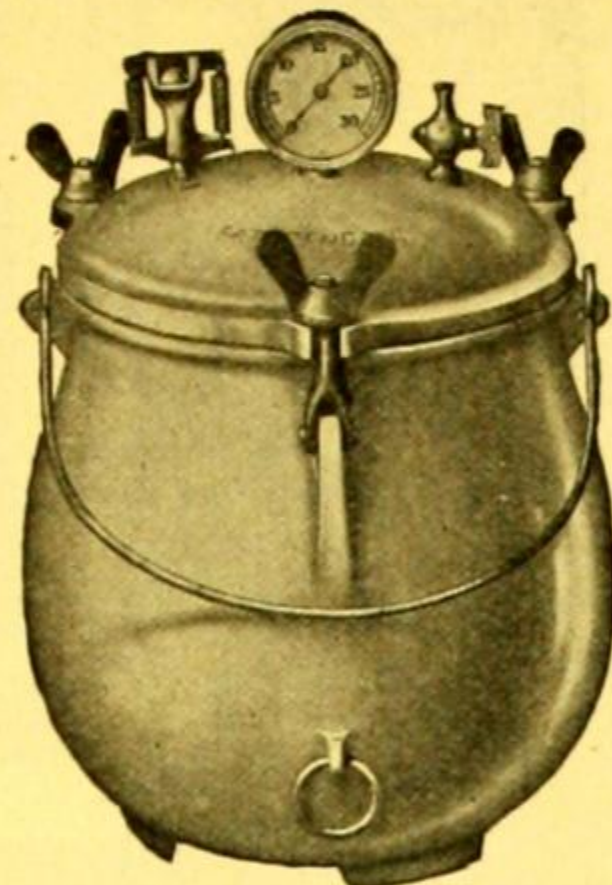
In ordering for electric heat, kindly state voltage and kind of current.

419F. AUTOCLAVE, High Pressure, Copper Chamber, suitable for making digestions under pressures up to 50 atmospheres. The chamber of 3 liters capacity is made of copper, fitted with a heavy brass cover equipped with a pressure gage, thermometer well and safety valve with sliding weight. A heavy iron horseshoe clamp with a central pressure screw is provided for tightly clamping the cover in place. The copper body is supported by an iron shield with three heavy iron legs. Inside dimensions 150 mm by 200 mm. Complete with three wrenches..... 180.00

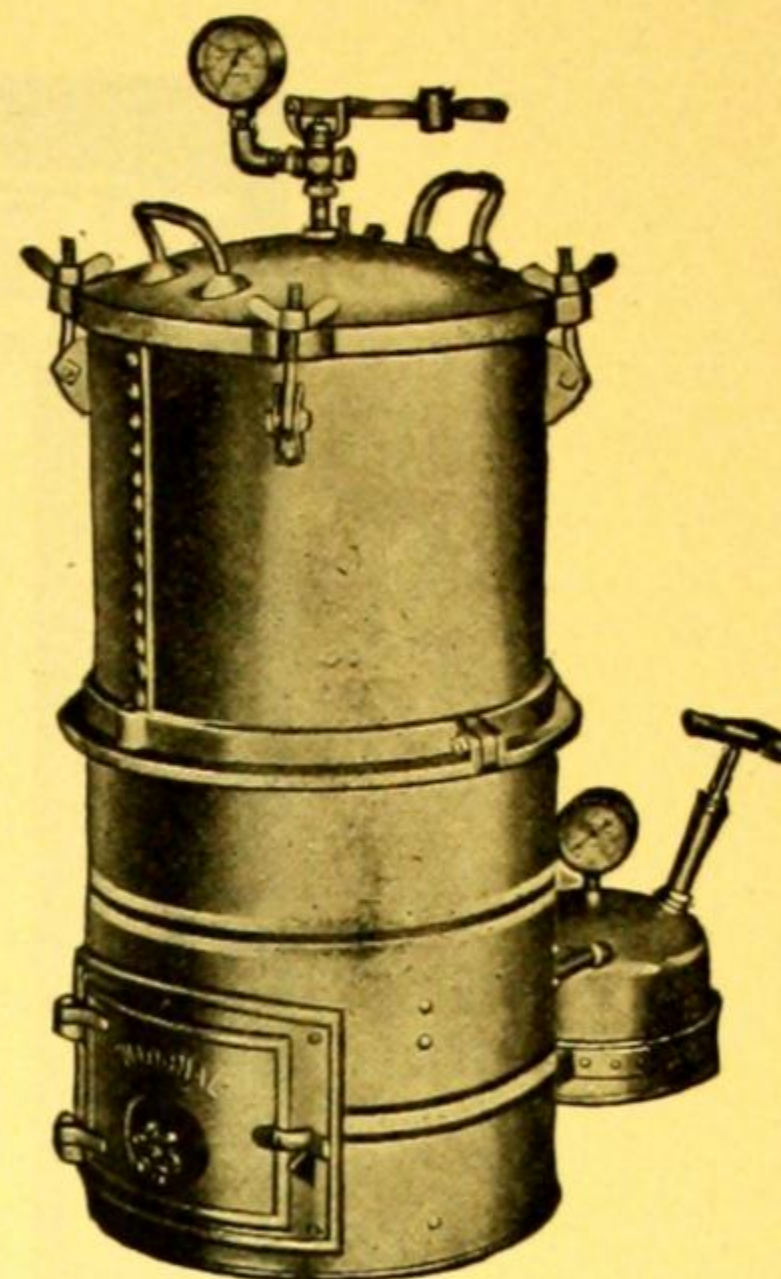
420. AUTOCLAVES, High Pressure, Steel Chamber, for digestion under steam pressures up to 1000 pounds per square inch. Consists of a chamber of seamless drawn steel with $\frac{5}{16}$ inch wall, to which is threaded and welded a heavy cast iron collar. A cap of the same material is accurately fitted with a packing joint and clamped to the collar by means of six heavy steel stud-bolts. The cap is equipped with a pressure gage, a blow-off valve for releasing confined gases when desired, a low pressure safety valve, which, when set, releases the pressure at 250 pounds per square inch, a high pressure safety valve for pressures over 250 pounds per square inch, and a thermometer well sunk to within one inch of the bottom of the chamber. The autoclaves are tested hydraulically to 1000 pounds per square inch. A polished steel jacket mounted



No. 421.



No. 422.



No. 429.

AUTOCLAVES, High Pressure, Steel Chamber, Continued.

on a heavy cast iron base supports the digestion chamber in the proper position for heating with a high power gas burner. Complete as described, with burner but without thermometer.

No.	A	B	C
Diameter inside, inches.....	6	8	10
Depth inside, inches.....	12	12	12
Each	\$208.00	240.00	292.00

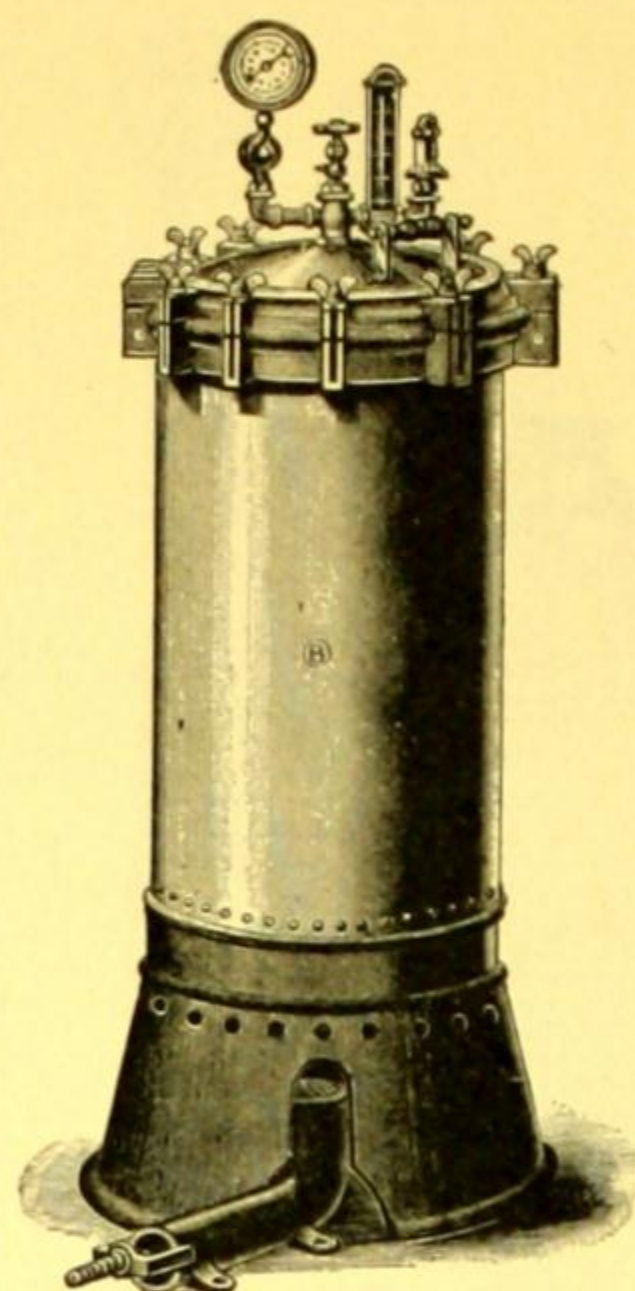
421. **Gas Regulator**, for controlling temperature and pressure of No. 420 autoclaves. By means of this device, designed to screw into cap, the gas flow is automatically controlled to maintain any desired temperature or pressure. Provided with a special attachment for keeping burner lighted when gas flow is reduced to very low pressure 14.00

422. **AUTOCLAVES, Pressure Cookers**, of cast aluminum, very useful for sterilization or digestion under moderate pressure. Extensively used in domestic science laboratories for cooking under pressure. Can be used over any laboratory burner. Complete with pressure gage reading to 30 pounds, safety valve, petcock, and attachment for thermometer.

No.	A	B	C
Diameter at top, inches.....	8	9½	10½
Greatest diameter, inches.....	10	11½	12¾
Depth, inches	10	12	14
Capacity, quarts.....	10	17	25
Weight, pounds	8½	14½	21
Shipping weight, pounds.....	11	19	28
Each	19.00	26.00	33.00

AUTOCLAVES, Pressure Sterilizers, single wall, made of steel boiler plate, riveted and calked at the seams, with heavy flange. The cover is of semi-steel with sanitary packing and thumb screw clamps to hold firmly in place, and is provided with handles. The equipment includes polished copper rack tinned inside to hold articles to be sterilized, platform for rack, safety valve, steam gage, steam circulating device, thumb-nut wrench, and cover lifting device (on two larger sizes). Finished in aluminum bronze.

No.	A	B	C
Tested for pressure, pounds.....	30	50	50
Depth of chamber, inches.....	18	18	27
Diameter of chamber, inches.....	12	18	25
Height over all, inches.....	39½	40½	53
Width over all, inches.....	26	30	40
Sterilizing capacity, cubic inches.....	1350	2475	7620
Size of rack, inches.....	11½x13	14x15	21x22
Shipping weight, pounds.....	130	235	440
428. With steam coil and gas burner.....	75.00	105.00	170.00
429. With steam coil and gasoline burner.....	75.00	105.00	170.00



Nos. 431A-438A.

AUTOCLAVES, Vertical Pressure Sterilizers, made of heavy polished copper tinned inside and mounted on an enclosed sheet iron base to protect the burner from drafts. The lid is made of heavy cast brass, nickel-plated and ground perfectly to form a gas tight bevel joint without the use of washers. For convenience, the heavy lids of the larger sizes are hinged, but on the smaller sizes the lids are entirely removable to enable the operator to seat them well before clamping with the heavy screw clamps. The lid is fitted with a safety valve set to blow off at 30 pounds per square inch, an air cock through which the air is expelled, a dial pressure gage indicating pounds per square inch, and a thermometer graduated in degrees Centigrade with an additional scale showing the steam pressure in pounds per square inch. Each sterilizer is tested for a pressure of 35 pounds per square inch. Because of the large current required to operate the electrically heated type, about 18 amperes, special wiring must be provided. For gas heating a low form gas burner is provided and for oil heating a kerosene burner. Complete as described with a removable rack with two perforated shelves and with type of lid and heating equipment as listed below.

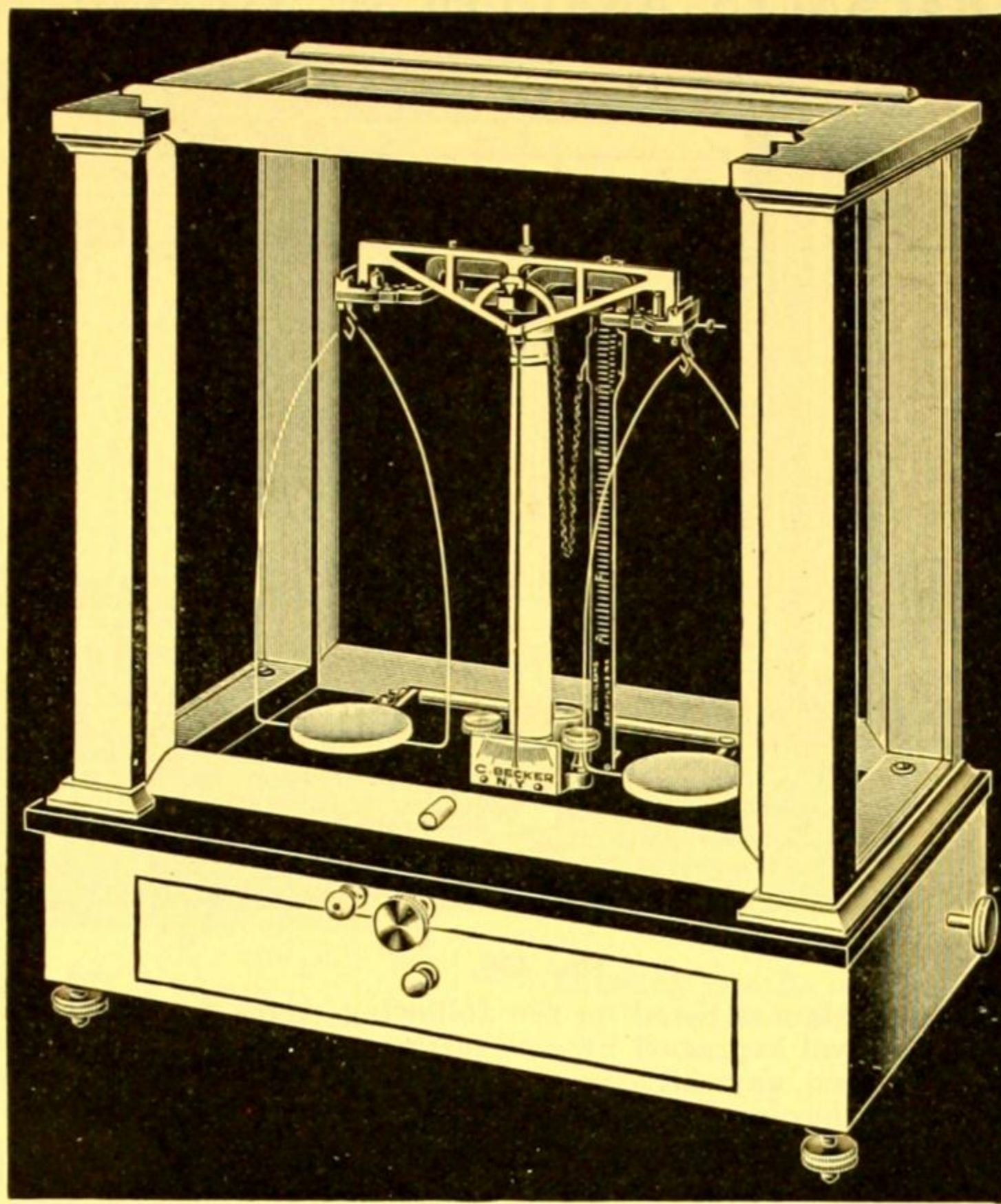
	Type of heat	Type of lid	Height inches	Diameter inches	Price
431A.	Gas	removable	12	8	\$ 55.00
431B.	Oil	"	12	8	58.00
431C.	Electric	"	12	8	90.00
432A.	Gas	"	24	11	81.00
432B.	Gas	hinged	24	11	88.00
433A.	Oil	removable	24	11	88.00
433B.	Oil	hinged	24	11	95.00
434A.	Electric	removable	24	11	130.00
434B.	Electric	hinged	24	11	140.00
436A.	Gas	"	26	14	117.00
437A.	Oil	"	26	14	122.00
438A.	Electric	"	26	14	176.00

In ordering for electric heat, kindly state voltage and kind of current.

For **STERILIZERS** of other types, see general heading **Sterilizers**.

BACTERIOLOGICAL APPARATUS, see special headings, **Autoclaves**, **Incubators**, **Sterilizers**, etc.

We maintain a special hospital and medical laboratory department, which will furnish standard lists of equipment, compile lists for special work and make estimates on the cost of laboratory equipments. Hospitals desiring to meet State requirements or to become standardized hospitals, will find the assistance of this department invaluable.



No. 450.

BALANCES, ANALYTICAL, CHAIN

In the chain analytical balance is presented a novel feature of balance construction. The old rider arrangement is done away with entirely, and the finer weighings are obtained by changing the length of a small gold chain attached at one end to the beam of the balance, and at the other to a vernier which slides on a graduated vertical column. The vernier is operated by a spiral drive controlled from a milled head on the outside of the case. By this means all weighings from 1/10th milligram to 50 milligrams can be made without opening the case or using the beam arrest. In this way the rapidity and accuracy of weighing is greatly increased, as there are no small weights to handle and count and no rider to move back and forth. We estimate that 75 per cent of the time used in making a weighing is saved by this new method.

The balances themselves are well constructed, with large agate planes, finely ground knife edges, and separate pan arrest. The base is covered with a heavy black glass plate.

450. BALANCE, Analytical Chain, Christian Becker No. 8-A.

Capacity	200 grams.	Length of beam	7 inches
Sensitiveness	1/20 milligram.	Bearings	agate planes.
Diameter of pans	2 3/8 inches.	Knife edges	agate.

Independent arrest for pans with automatic stop.
Width of pan support 4 inches; wider if specified.
Polished mahogany and glass case, glass top, front sliding frame counterpoised.
Dimensions of case: 16 1/4 inches long; 9 inches wide; 18 1/2 inches high.

Price, with Chain Vernier attachment, mounted on black plate glass base..... \$190.00

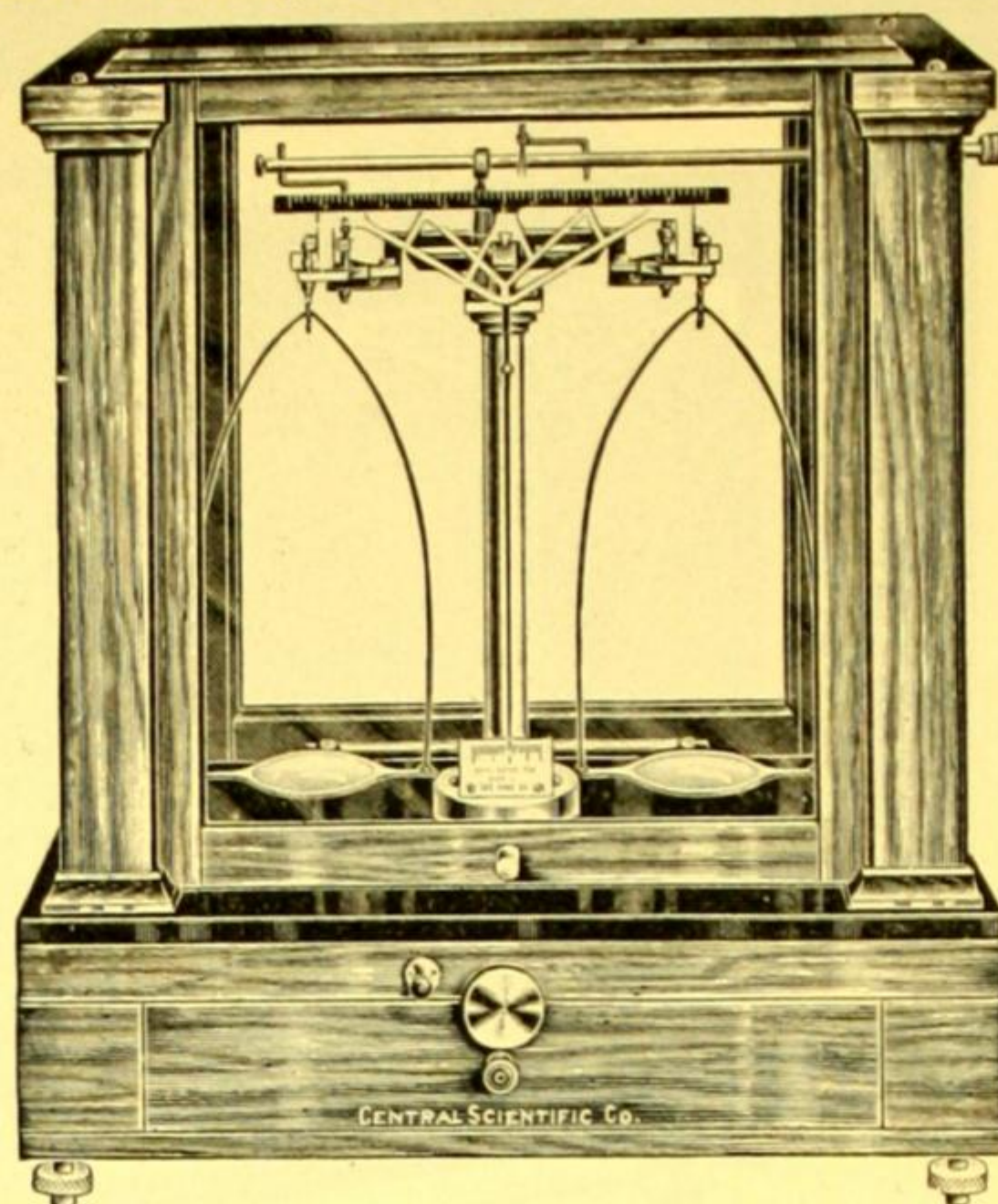
452. BALANCE, Analytical Chain, Christian Becker No. 15.

Capacity	100 grams.	Length of beam	6 inches.
Sensitiveness	1/20 milligram.	Bearings	agate.
Diameter of pans	3 inches.	Knife edges	agate.

Independent arrest for pans with automatic stop.
Width of pan support 4 inches; wider if specified.
Polished mahogany and glass case, glass top, front sliding frame counterpoised.
Dimensions of case: 16 1/4 inches long; 9 inches wide; 18 1/2 inches high.

Price, with Chain Vernier attachment, mounted on black plate glass base..... 150.00

BALANCES, ANALYTICAL, VOLAND



No. 455.

We have sold the line of balances listed on the following pages for a great many years and are convinced by the uniform approval expressed by our customers that there are no better balances of corresponding grade manufactured anywhere in the world. Only the highest grade of materials is used in their construction and they are made under the personal supervision of men in whose family for generations the art of balance making has been developed with almost professional pride in its achievements. Since these balances are **made in America**, we are able to handle all repairs and adjustments with a minimum loss of time and at a minimum expense, not possible in the case of foreign made balances. We recommend them unequivocally, and each balance is sent out under our guarantee of entire satisfaction to the user.

These balances present certain new features in their construction, which should commend their use in rapid yet precise chemical weighing. They are of simple construction, easily adjusted, and with small danger of shifting sensibility since they are supported from a single point on a broad central agate plane. The releasing mechanism is of the fallaway type, controlled by an eccentric shaft turned by the milled head in the front. The red graduation of the index plate and the white graduation of the black beam facilitate rapid, accurate readings. The short beam provides short periods of oscillation. The patented rider arrangement makes it possible to work on either side of the zero line and prevents the rider from slipping back on the shank of the hook. All bearings are of agate. All cases are of mahogany finely finished, and provided with glass on all sides, admitting light freely to all parts. The front door is counterpoised and slides freely. The list below includes types from which one may select a balance for any kind of technical or analytical work.

455. **BALANCE, Analytical, Precision Model**, for use in research and in advanced chemical work requiring highest accuracy. This balance is equipped with every refinement of balance manufacture by which the accurate determination of mass may be facilitated.

Distinctive Features:—

Beam of hard-rolled aluminum alloy.
 Beam graduated in 50 one-tenth mg divisions on each side of zero.
 Circular spirit level in plain sight from front.
 Rear door can be raised or removed for weighing pipettes, etc.
 Base completely covered with heavy black plate glass and fitted with large drawer for weights.
 Patented rider arrangement provided with starter for swinging beam, operated from without case.
 Knife edges relieved from contact with bearings when not in use.
 Pan arrest separate from release; can be locked.

Specifications:—

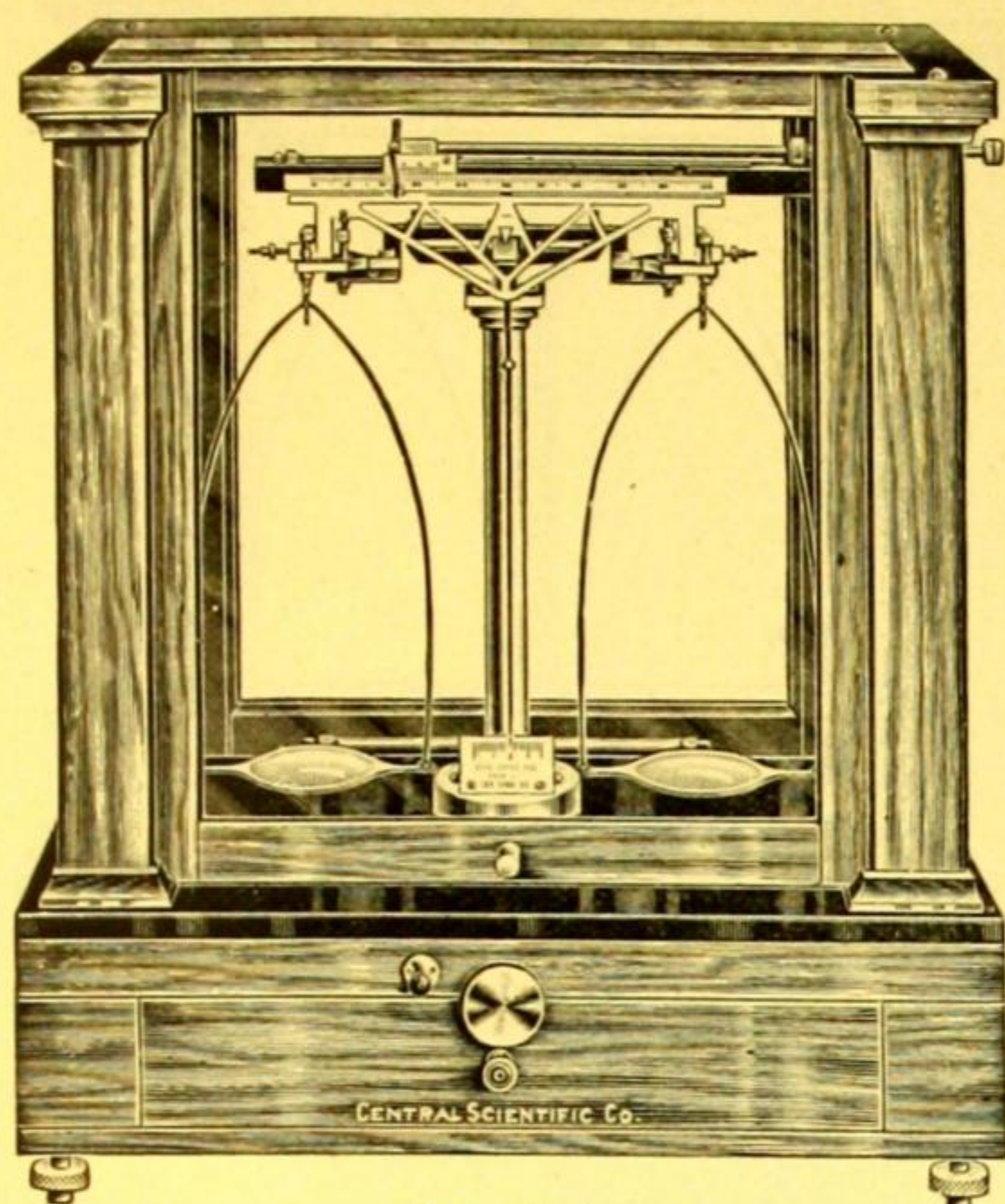
Dimensions of case— $16\frac{3}{4} \times 20\frac{1}{2} \times 9\frac{1}{2}$ inches.	Capacity ----- 200 grams.
Length of beam----- 7 inches.	Sensibility ----- $\frac{1}{20}$ th milligram.
Diameter of pans----- $2\frac{1}{2}$ inches.	Weight of rider----- 5 milligrams.
Width of bows----- $4\frac{1}{4}$ inches.	

Equipment Furnished:—

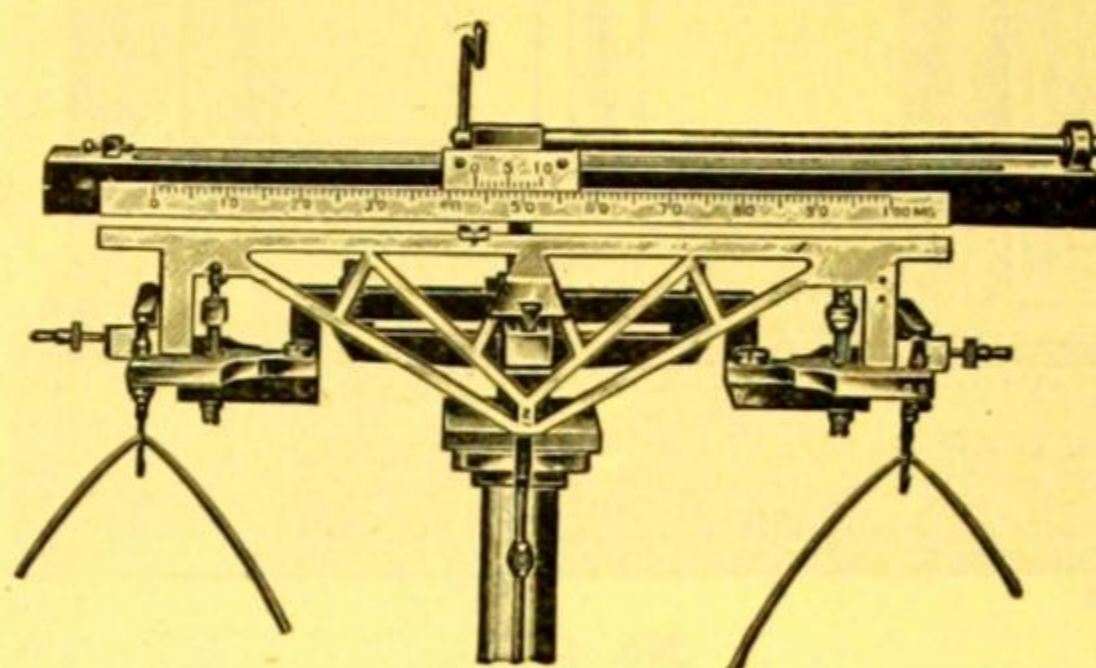
One pair 3 inch watch glasses.
 Three 10-milligram riders.
 Wood bench for specific gravity work.

Price \$130.00

A NEW PRECISION BALANCE FOR RAPID WEIGHING



No. 457.



Showing Details of Weight Placing Attachment and Vernier Reading Device.

457. **BALANCE, Analytical, Precision Model**, same as No. 455, but with patented weight placing attachment and vernier reading device by means of which all weighings from 100 mg. down can be made without the use of fractional weights or riders. This feature makes Balances Nos. 457 and 461 more rapid and convenient to use than any other analytical balance manufactured in this country. Differences in weight of one hundred milligrams or less are determined by means of a pointed sliding weight to which a vernier is attached. The position of this weight is controlled by a placing rod which protrudes through the side of the case ending in a milled head. By twisting this, a hook on the inner end is caused to engage the sliding weight which may then be moved to either side as desired. A scale is attached to the upper edge of the beam, graduated from 0 at the left to 100 mg. by single divisions, each tenth division being numbered. The zero mark on the vernier indicates accurately the position of the sliding weight on the beam, the tenth milligrams being determined as usual, by the number on the vernier line which coincides with any line of the beam scale.

This method of obviating the use of small weights and riders is thoroughly scientific, since it makes use of a sliding poise of fixed weight about whose position on the beam there is no room for doubt. It is entirely free from the disadvantages of the bent wire rider whose shape is easily distorted and which usually flies off the beam just at the time when a weighing is about to be completed. It is rapid as well as accurate, eliminating the necessity for most of the additions which are the peril of analytical weighing. The figures on the vernier as well as those on the beam are plain and easily read and there is not the chance for confusion of figures which so frequently occurs in using fractional weights.

We recommend this balance to industrial and research laboratories where routine weighings are made in large number and where the time element is an important factor.

Distinctive Features:—

Beam of hard-rolled aluminum alloy.
 Beam graduated in 50 one-tenth mg divisions each side of center.
 Spirit level in rear of base of column.
 Rear door can be raised or removed for weighing pipettes, etc.
 Base completely covered with heavy black plate glass and fitted with large drawer for weights.
 Knife edges relieved from contact with bearings when not in use.
 Separate pan arrest, stopper of which can be locked.

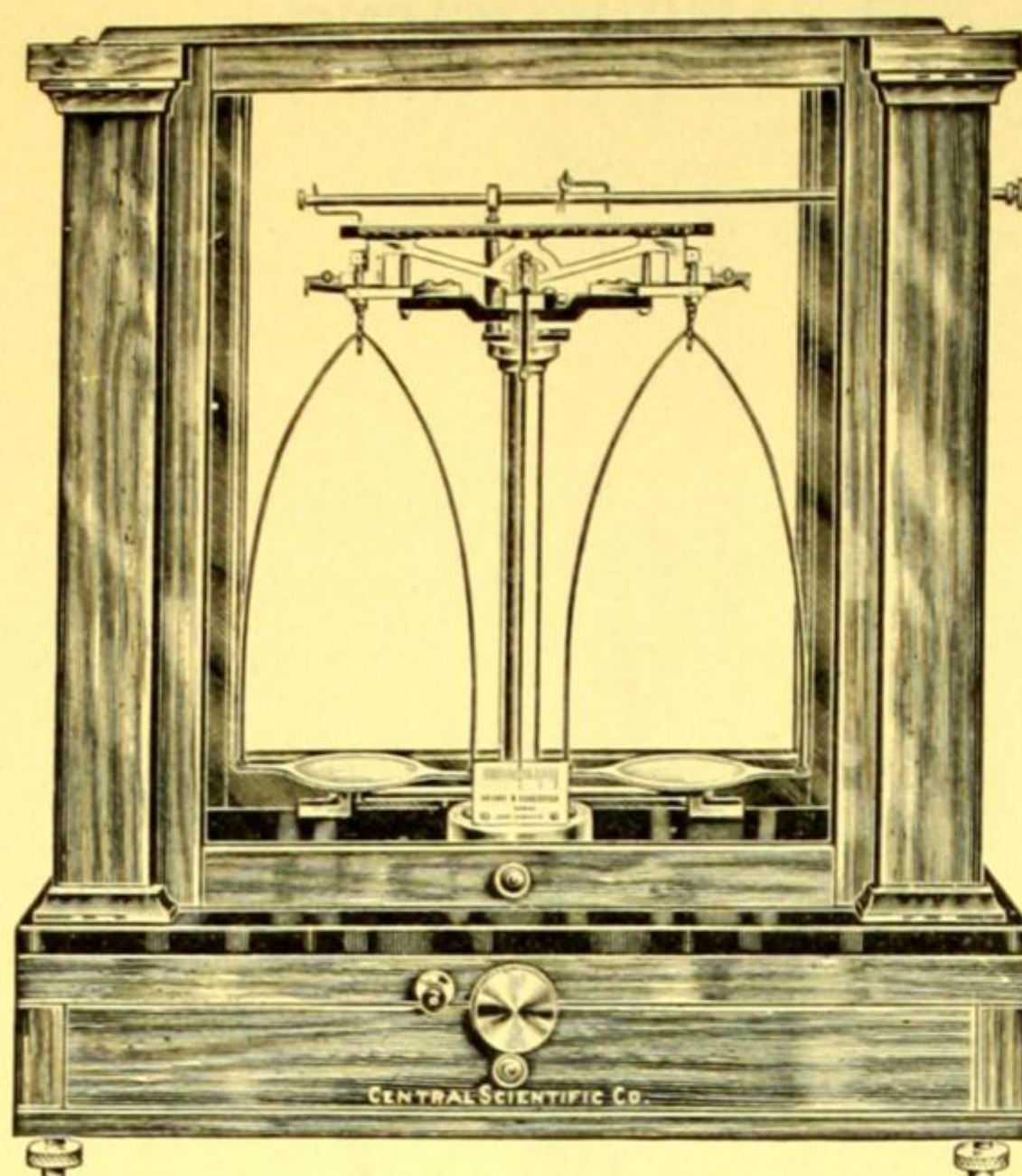
Specifications:—

Dimensions of case— $16\frac{3}{4} \times 20\frac{1}{2} \times 9\frac{1}{2}$ inches.	Width of bows— $4\frac{1}{4}$ inches.
Length of beam—7 inches.	Capacity—200 grams.
Diameter of pans— $2\frac{1}{2}$ inches.	Sensibility— $1/20$ th milligram.

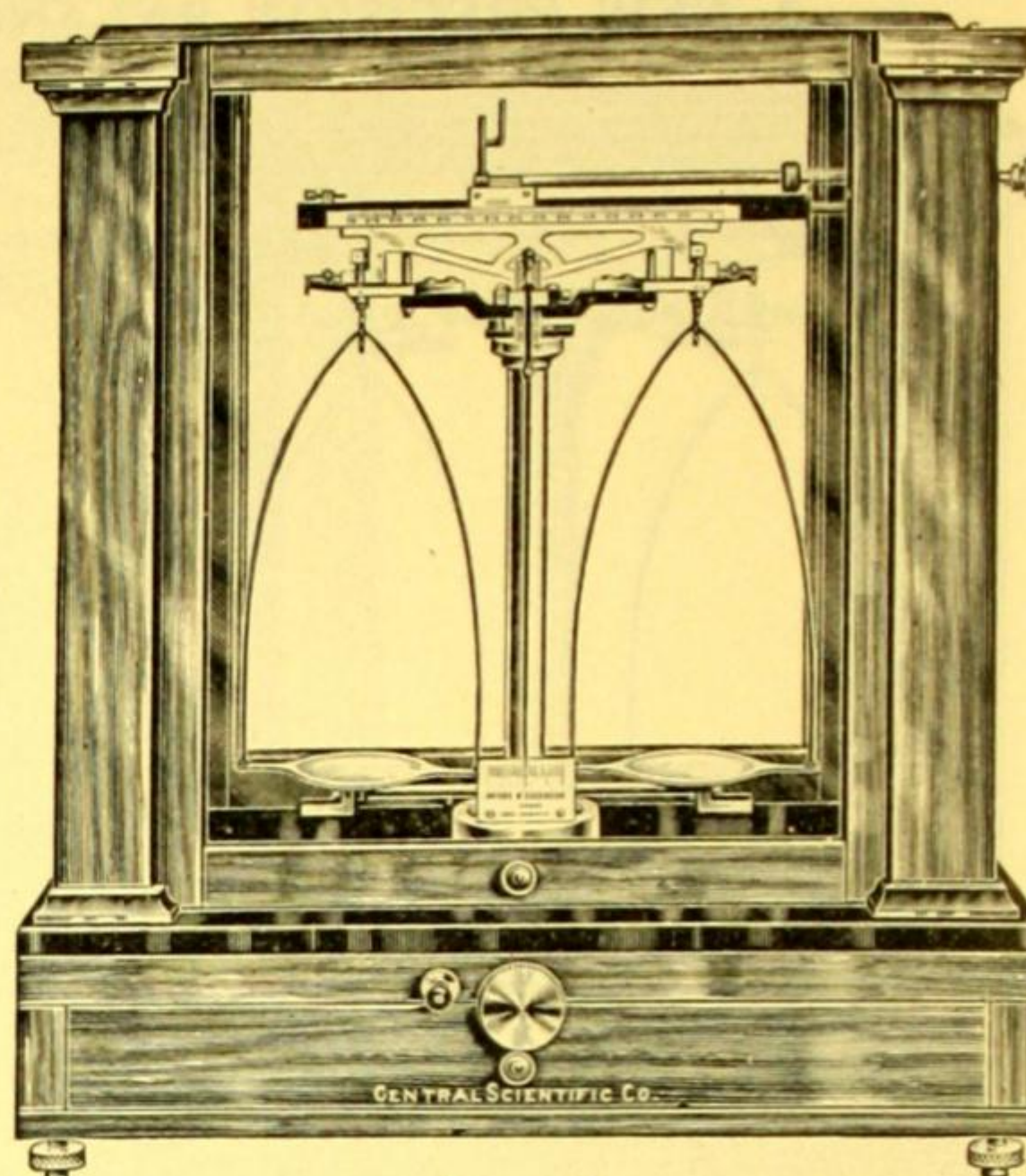
Equipment Furnished:—

One pair 3 inch watch glasses.
 Wood bench for specific gravity work.

Price \$180.00



No. 459.



No. 461.

459. BALANCE, Analytical, University and Industrial Model, similar in construction to No. 455, but with shorter beam and reduced sensitiveness to facilitate rapid weighing for analytical purposes. This balance is especially designed for advanced work in chemical analysis in colleges and universities, and for routine analytical work in plant control and testing laboratories, where both rapidity and accuracy are required. It possesses all of the special features of construction described under No. 455 and is sent out under our unqualified guarantee of satisfaction.

Distinctive Features:—

Short beam of hard-rolled aluminum.
 Beam graduated in 50 one-tenth mg divisions each side of center.
 Spirit level in rear of base of column.
 Rear door can be raised or removed for weighing pipettes, etc.
 Base completely covered with heavy black plate glass and fitted with large drawer for weights.
 Knife edges relieved from contact with bearings when not in use.
 Patented rider arrangement.
 Separate pan arrest, stopper of which can be locked.

Specifications:—

Dimensions of case— $16\frac{3}{4} \times 20\frac{1}{2} \times 9\frac{1}{2}$ inches.	Capacity ----- 200 grams.
Length of beam-----6 inches.	Sensibility ----- $\frac{1}{10}$ th milligram.
Diameter of pans----- $2\frac{1}{2}$ inches.	Weight of rider-----5 milligrams.
Width of bows----- $4\frac{1}{4}$ inches.	

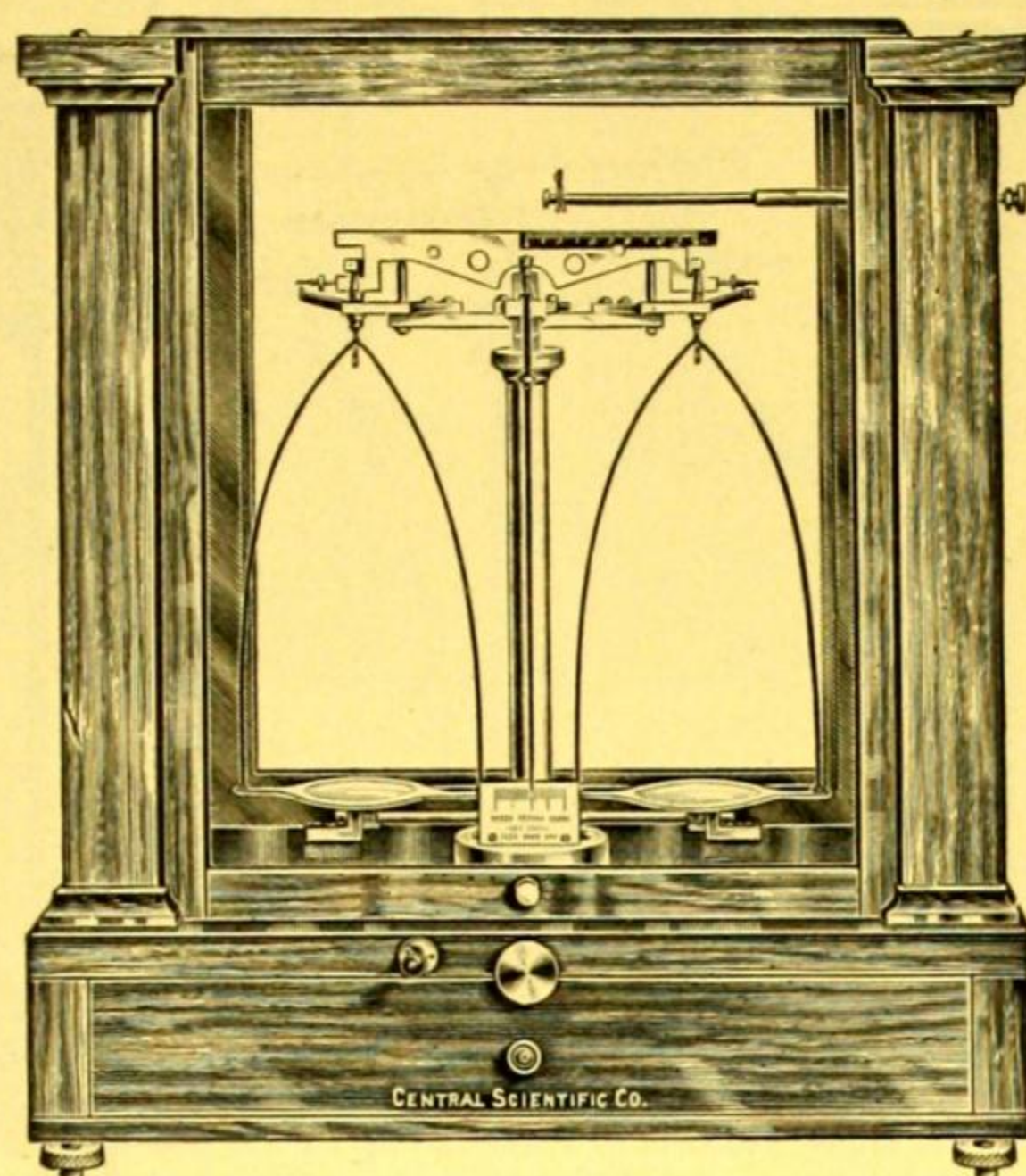
Equipment Furnished:—

One pair 3 inch watch glasses.
 Two 5-milligram riders.
 Wood bench for specific gravity work.

Price \$100.00

461. BALANCE, Analytical. Same as No. 459, but with patented weight placing attachment and vernier reading device described on preceding page. For complete specifications, see No. 459 above.

Price \$150.00



No. 471.

471. **BALANCE, Analytical, College Model**, similar in construction and appearance to No. 459, but with solid aluminum beam, drilled to reduce its weight, and with graduations only on the right side of center knife edge. All parts are constructed of standard material, are highly polished and are mounted in a finely polished mahogany case, characteristic of this line of balances. All standard Volland features described under Nos. 455 and 459 are preserved. This is an excellent balance for student work in chemical analysis and for industrial laboratories making routine analyses.

Distinctive Features:—

Short beam of polished aluminum.
 Beam graduated in 50 one-fifth mg divisions on right side of center.
 Large drawer in base for weights.
 Patented rider arrangement.
 Knife edges relieved from contact with bearings when not in use.
 Separate pan arrest, stopper of which can be locked.

Specifications:—

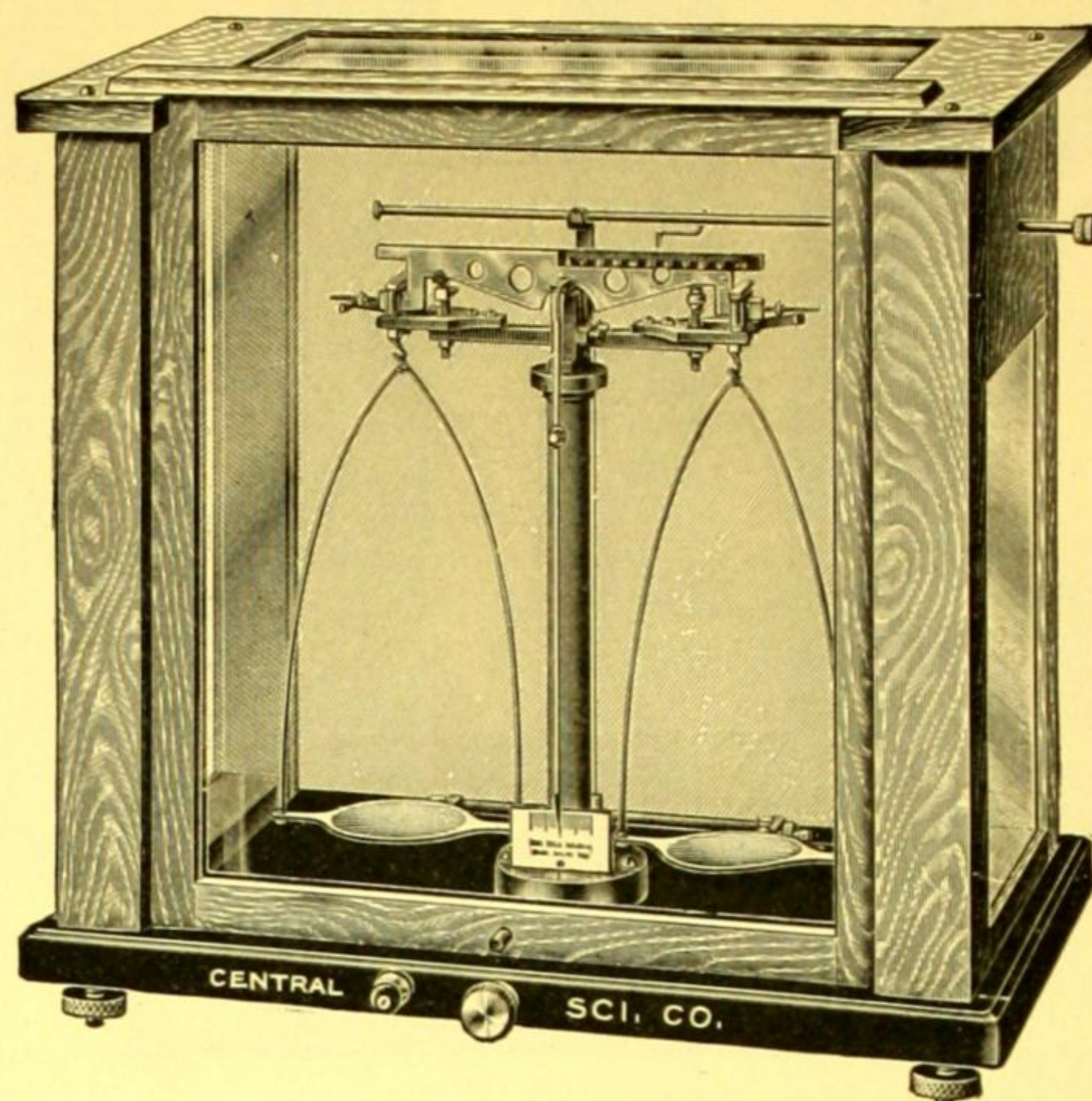
Dimensions of case— $16\frac{3}{4} \times 20\frac{1}{2} \times 9\frac{1}{2}$ inches.	Capacity -----200 grams.
Length of beam-----6 inches.	Sensibility -----1/10th milligram.
Diameter of pans----- $2\frac{1}{2}$ inches.	Knife edges and bearings-----agate.
Width of bows----- $4\frac{1}{4}$ inches.	Weight of rider-----5 milligrams.

Equipment Furnished:—

One pair 3 inch watch glasses.
 Two 5-milligram riders.
 Wood bench for specific gravity work.

Price \$85.00

CENCO ANALYTICAL BALANCE



No. 487.

BALANCE, Analytical, Cenco Model, designed to meet the needs of educational and commercial laboratories for an economical but dependable analytical balance.

Made especially for us by Voland & Sons, one of the largest and best known balance makers in America, it has all of the special features which have made their balances distinctive, such as white graduations on a black beam, red graduations on the white index plate, aluminum pans, patented rider carrier, solid mahogany case, etc. The entire cost of the balance is in essentials, as the balance has been simplified and the cost of construction reduced to the lowest possible figure by means of automatic processes and machinery. As a result of several years experience during which we have placed hundreds of these balances in educational and industrial laboratories, we do not hesitate to affirm our belief that a comparison of this balance with those of other makes, either American or foreign, will show it to be superior to any balance now obtainable for the same amount. We welcome such a comparison and will send a sample for thorough examination to any established institution contemplating the purchase of such balances.

Specifications:—

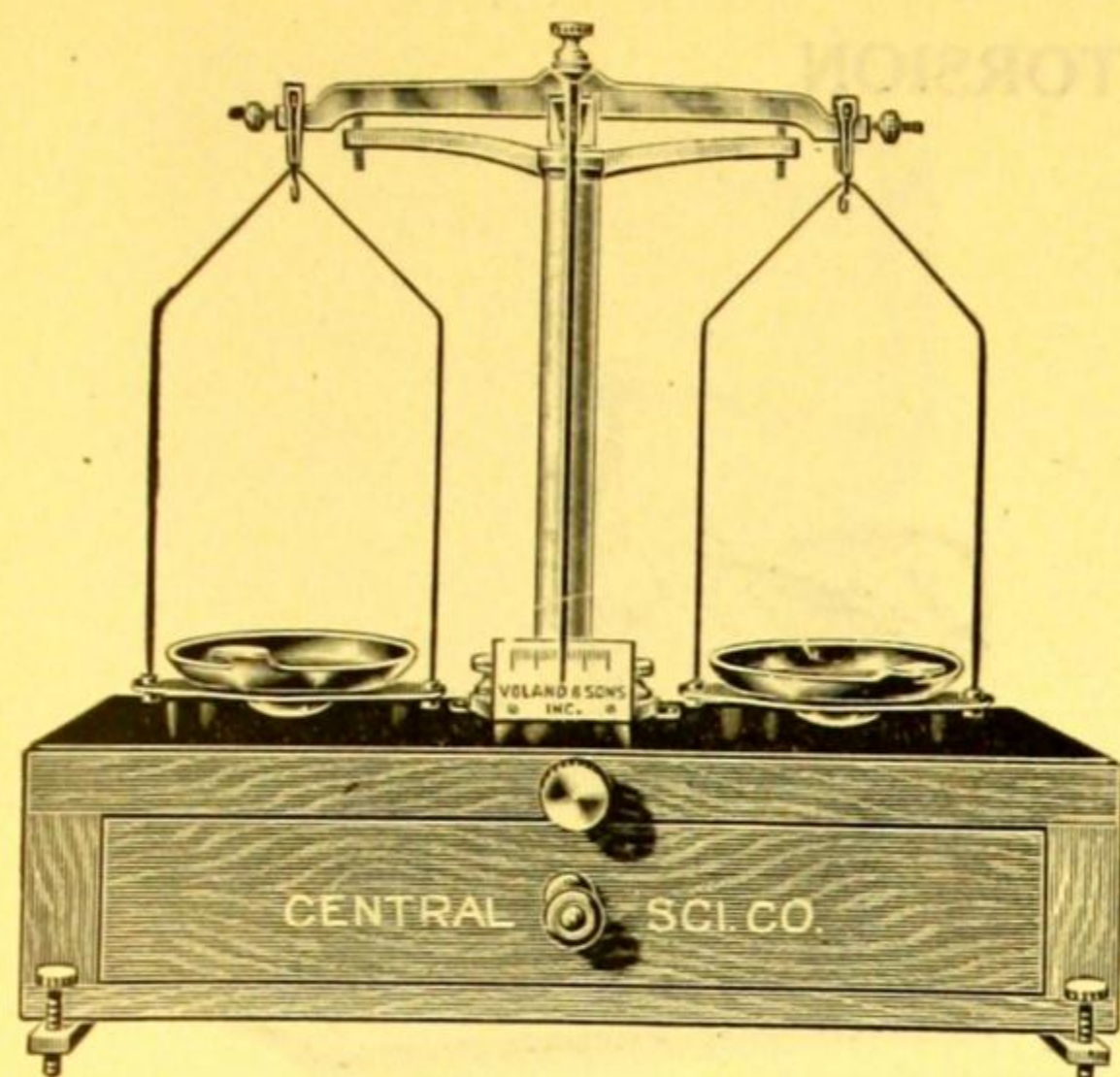
Beam	polished aluminum.	Capacity	200 grams.
Length of beam	6 in. graduated in 1/5 mg.	Sensibility	1/10 mg.
Divisions of beam	50 to right of center.	Knife edges and bearings	agate.
Size of case	16 1/2 x 17 x 9 1/4 inches.	Weight of rider	10 mg.
Base	slate.		

Distinctive Features:—

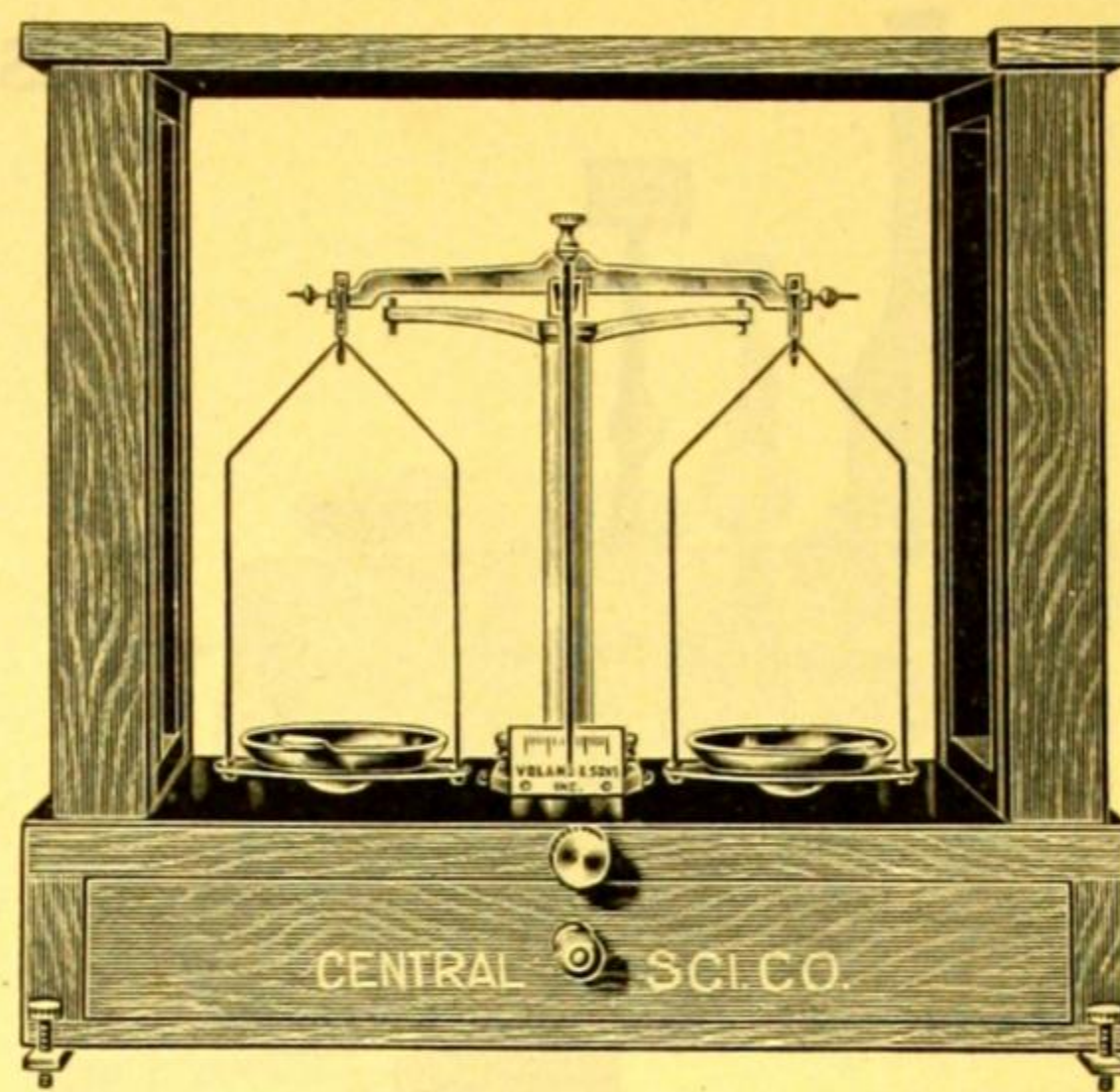
Knife edges free from contact when balance is at rest.
 Independent arrests for beam, stirrups and pans.
 Fenders at end of stirrup supports to check extreme swing of beam and prevent jarring or sliding of stirrups on knife edges.
 High sensibility and rapidity of swing.
 Graduations of beam white on black background.
 Index plate graduated in red.
 No steel in construction of balance and hence no corrosion.
 Case of fine polished mahogany with counterpoised front door and glass on all sides.
 Simple rider construction with patented rider hook.
 Base of heavy slate, to which all parts are firmly attached.

487. **BALANCE, Analytical, Cenco Model**, as described, on heavy slate base..... \$55.00

Note:—This balance should not be confused with those similar in appearance, but of cheaper construction, with cast metal pillar, single release for beam, stirrups and pans, and with zero over the left knife edge.



No. 503.



No. 509.

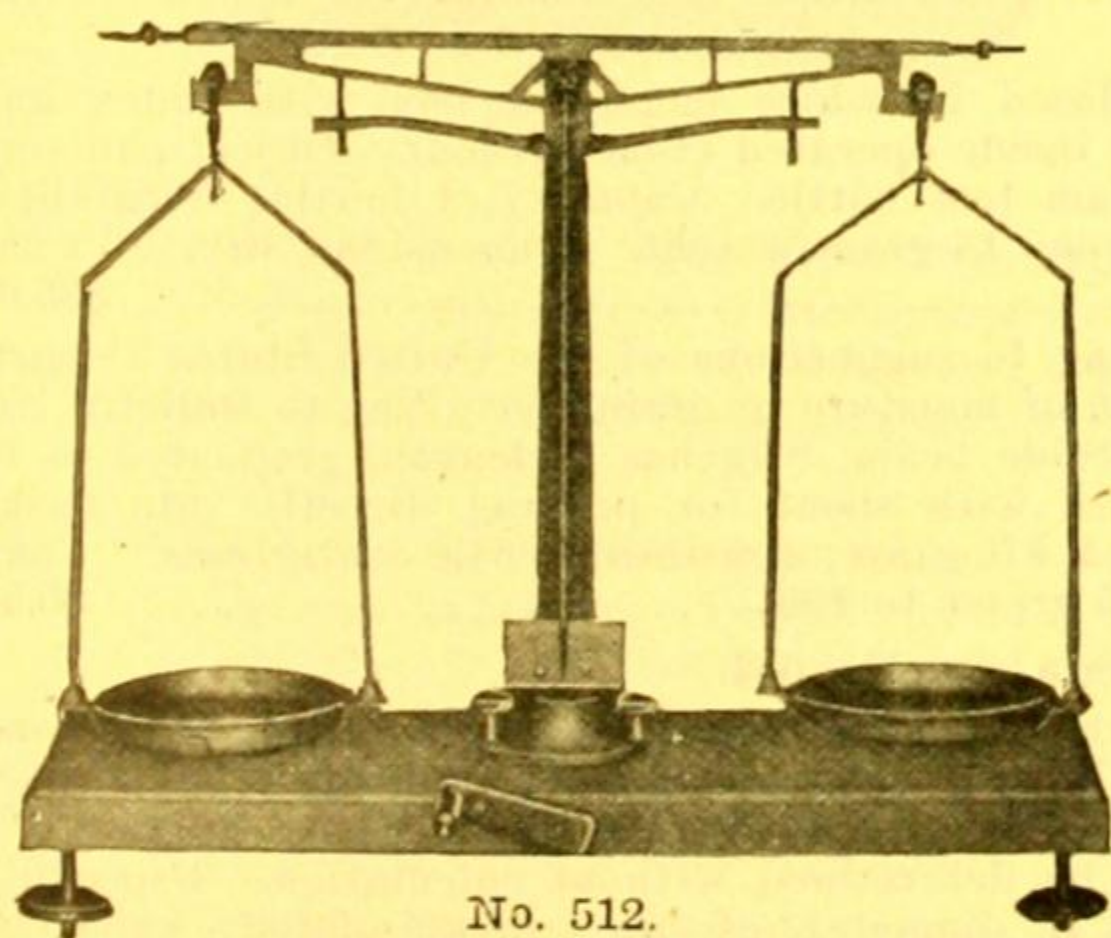
BALANCES, ASSAY

Complete information will be furnished upon request to anyone interested in Assay Balances. They have been omitted from this general catalog, since they are not of general interest.

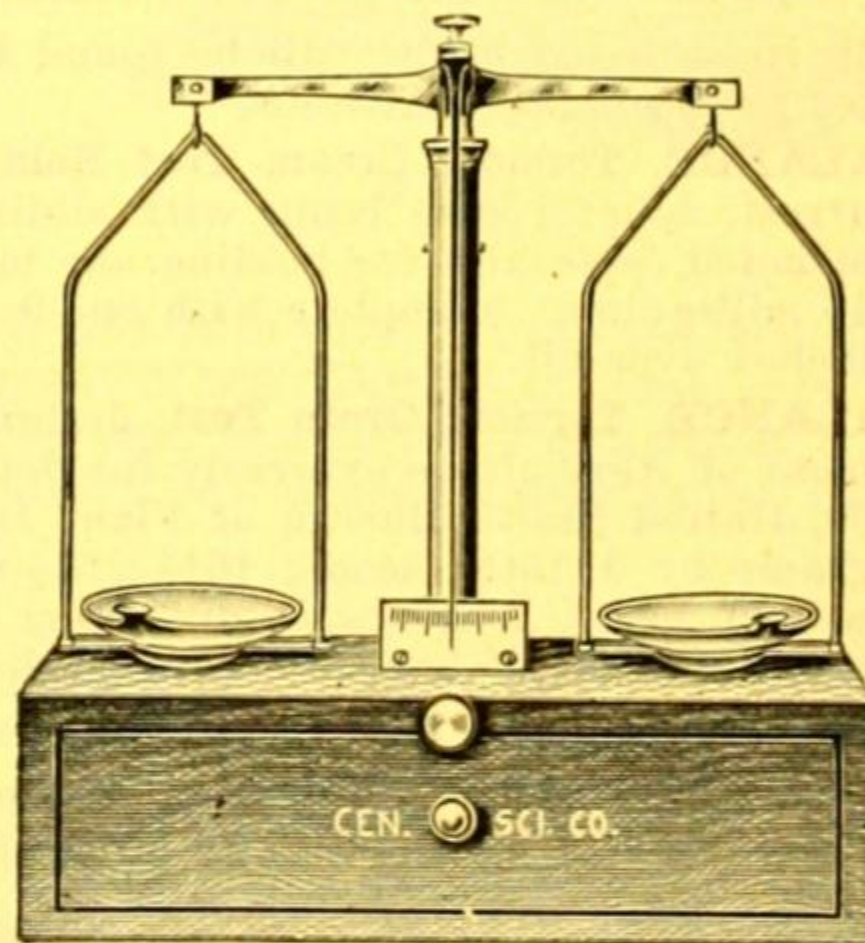
BALANCES, GENERAL LABORATORY

BALANCES, General Laboratory, for use in educational and industrial laboratories for purposes which do not require the degree of precision obtainable with an analytical balance. They are widely used for calibrating glassware, for weighing large samples of material, for weighing portions of reagents for solutions, for drugs, sugar, pulp, etc. The beam is raised by an eccentric movement operated by means of a milled head in the B size and by means of a handle in the others. They are provided with steel knife edges and **agate bearings**, beam arrest, adjusting screws on end of beam, removable nickel-plated weight pans with handles, and are fitted with level and leveling screws.

No.	B	C	D	E
Capacity, grams	150	300	600	1500
Sensibility, mg.	2	5	5	10
Diameter of pans, mm.	82	102	127	152
Beam length, mm.	178	235	267	286
503. On polished mahogany box with drawer	\$24.00	30.00	40.00	50.00
509. In polished mahogany case with counterpoised sliding front door and drawer	38.00	50.00	60.00	80.00



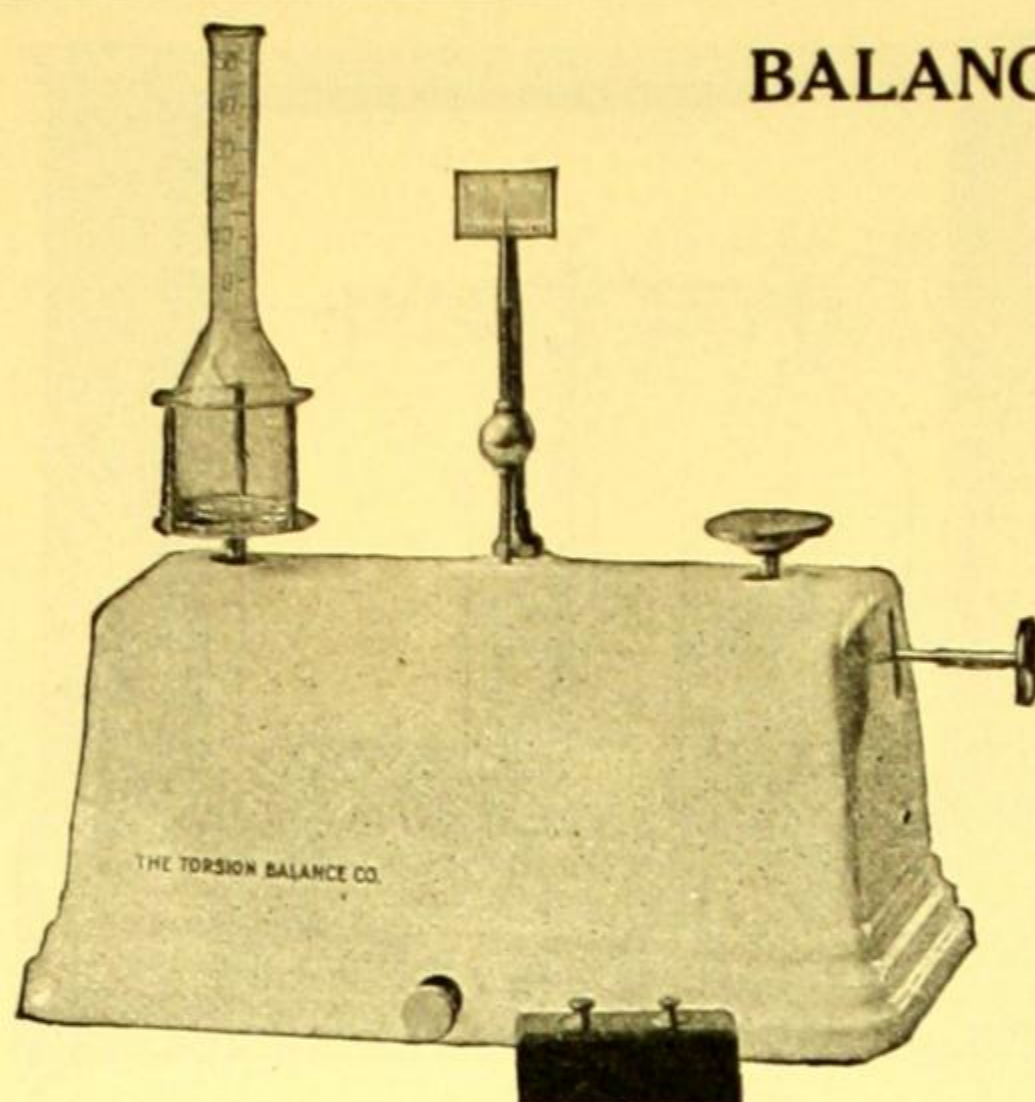
No. 512.



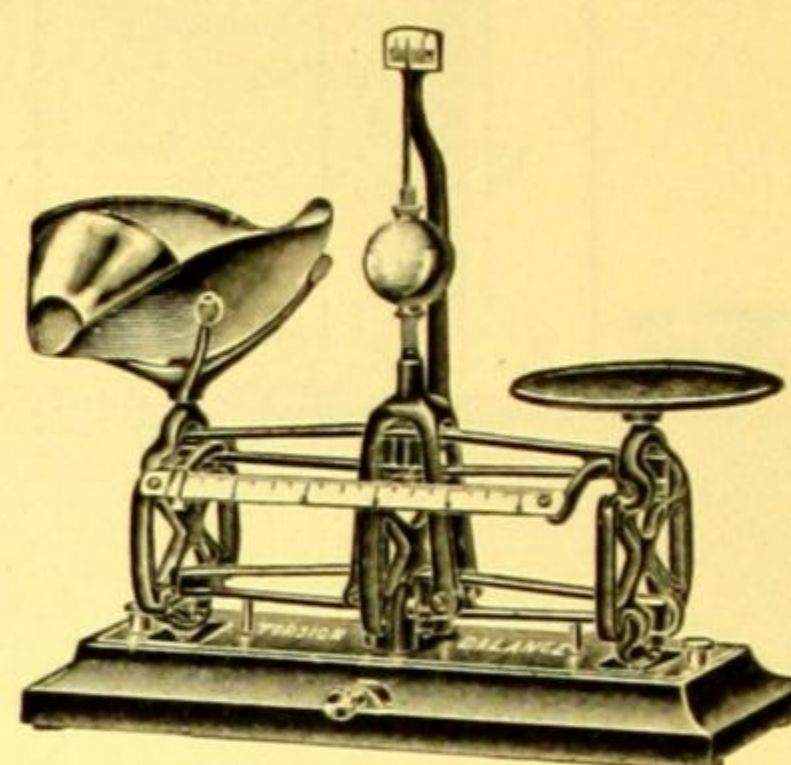
No. 514.

512. **BALANCE, General Laboratory, all-metal**, made entirely of **magnalium** which offers a high degree of resistance to all laboratory fumes. It has the further advantage of being light and strong. The knife edges and bearings are of **agate**. The beam is graduated and notched to facilitate the use of rider. Provided with beam support and leveling screws. Capacity, 100 grams; sensibility, 2 mg; diameter of pans, 75 mm. 30.00
514. **BALANCE, General Laboratory, Simplified Type**. Beam 150 mm long, pans 65 mm in diameter. Mounted on base with drawer. Capacity, 100 grams; sensibility, 1 centigram. 12.00

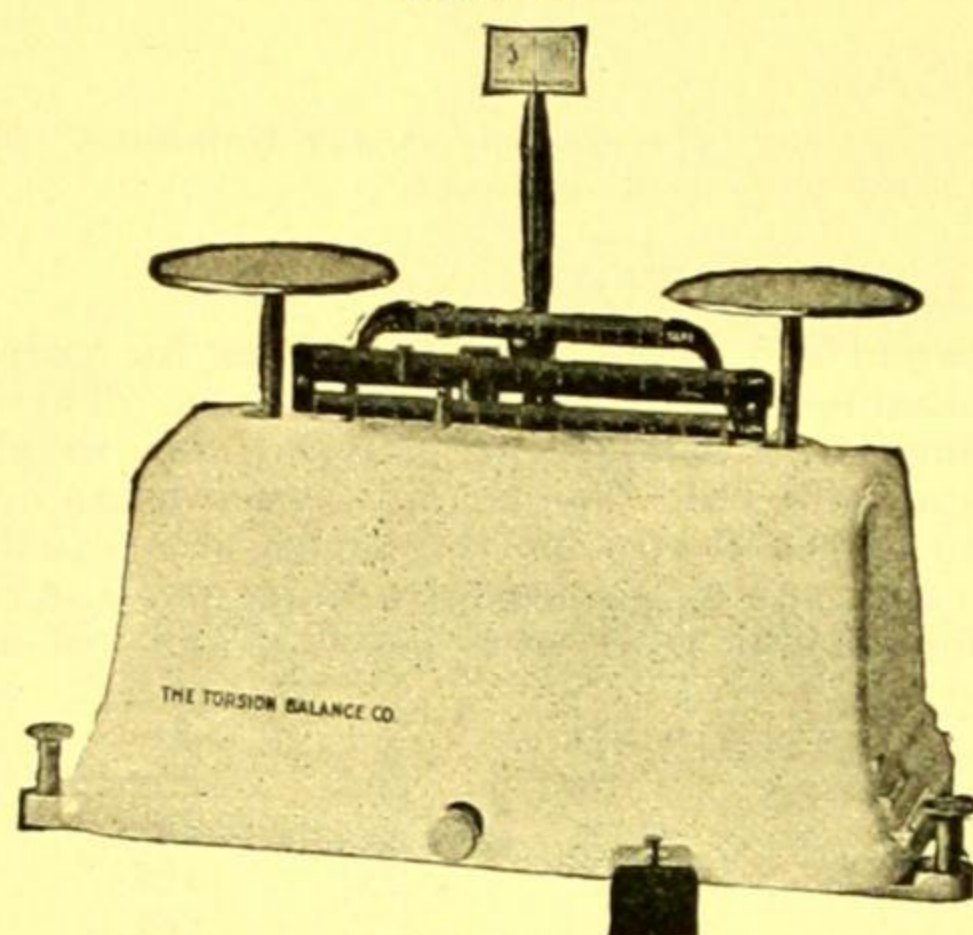
BALANCES, TORSION



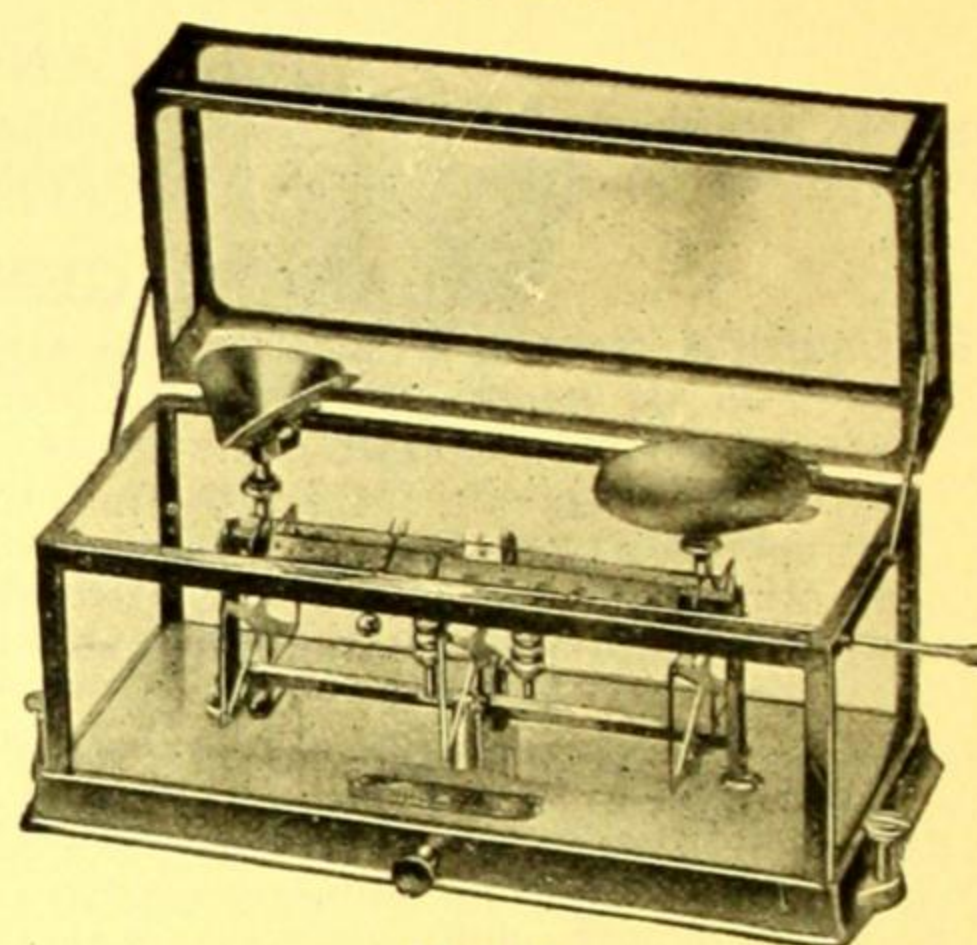
No. 517.



No. 520.



No. 525.



No. 528.

In the Torsion Balance the twisting of a steel band takes the place of the knife edge fulcrum, and this with its relatively short period of vibration makes the balance very rapid for accurate work.

Among those listed below will be found balances for practically every laboratory purpose except for the most precise analytical work.

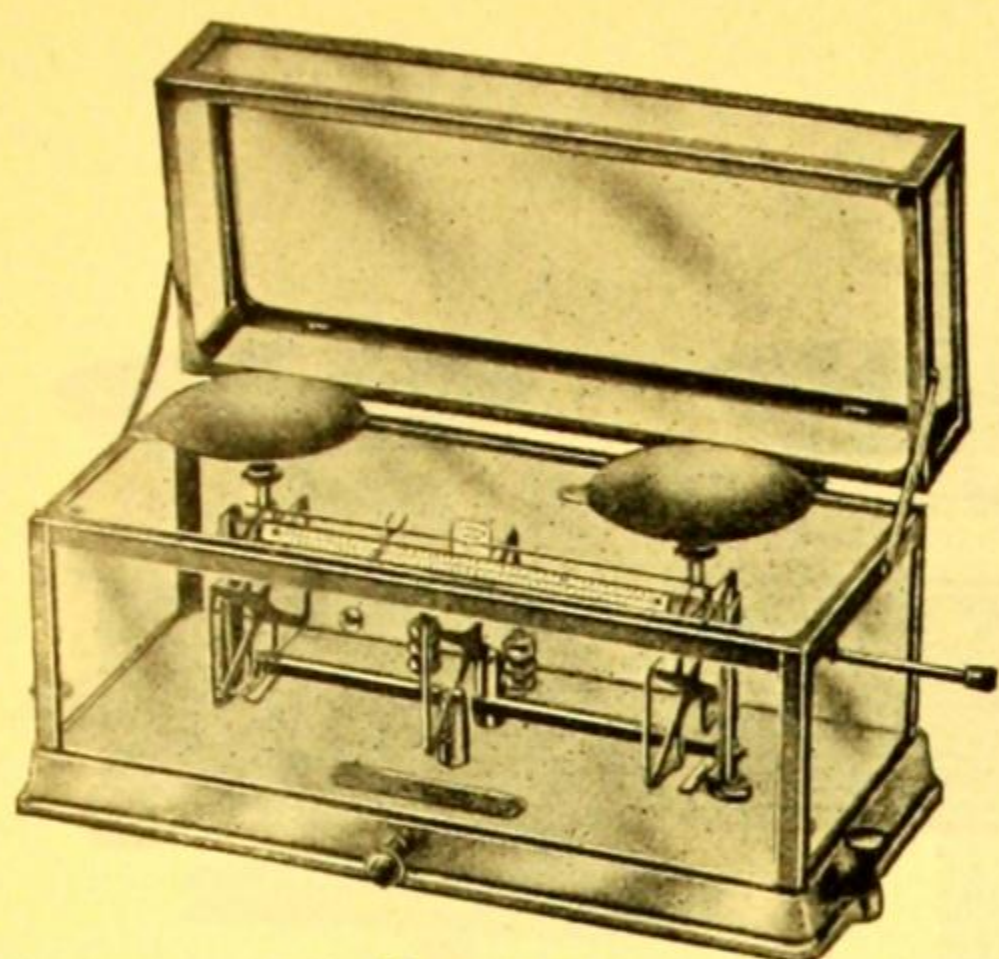
517. **BALANCE, Torsion, Cream Test Balance.** Enclosed in white enameled box with index and arrest, counterpoise beam with sliding weight inside operated from without. Object pan constructed especially for holding one milk or cream test bottle. Capacity, 1 bottle; sensibility, 16 milligrams. Complete with one 9 gram and one 18 gram weight. Dimensions, $10\frac{1}{2} \times 6 \times 9\frac{3}{4}$ inches over all. \$35.00

520. **BALANCE, Torsion, Grain Test,** designed according to suggestions of the United States Department of Agriculture expressly for determination of moisture in grain, according to Bulletin No. 99, United States Bureau of Plant Industry. Slide beam, 9 inches in length, graduated to 10 grams by $\frac{1}{10}$ th; scoop, $10\frac{1}{2} \times 5\frac{1}{2} \times 2\frac{1}{2}$ inches with spout for pouring directly into flask; weight plate, 4 inches in diameter; capacity, 1 kilogram; sensibility, $6\frac{1}{2}$ centigrams. Complete with set of brass weights in block, from 5 grams to 100. 35.50

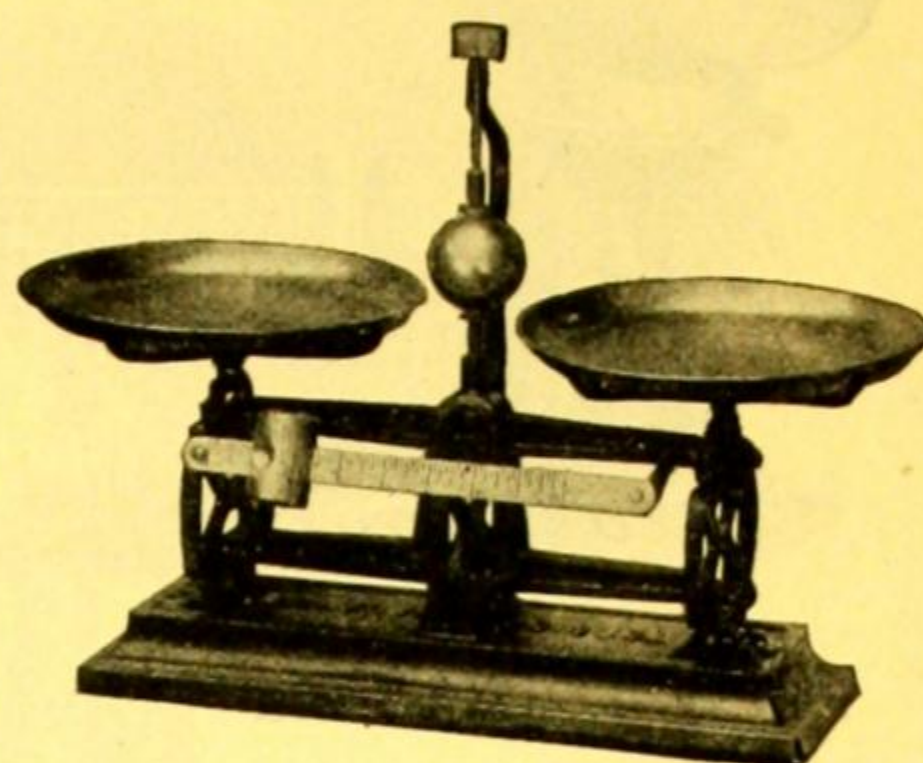
Note:—For another balance for use in testing grain, see No. 654.

525. **BALANCE, Torsion, Moisture.** Enclosed in white enameled case with leveling screws and index; four beams with sliding weights; two upper beams graduated for tare or counterpoise; lower beams graduated to 10% by $\frac{1}{10}$ th, and 20% by $\frac{2}{10}$ ths, so that from $\frac{1}{10}$ th of 1% to 30% of moisture in 10 gram samples can be determined without calculation. Especially valuable for moisture in butter. Pans, 3 inches in diameter, of brass nickel-plated; capacity, 120 grams; sensibility, 13 milligrams. Dimensions, $10\frac{1}{2} \times 6 \times 9\frac{3}{4}$ inches over all. 39.00

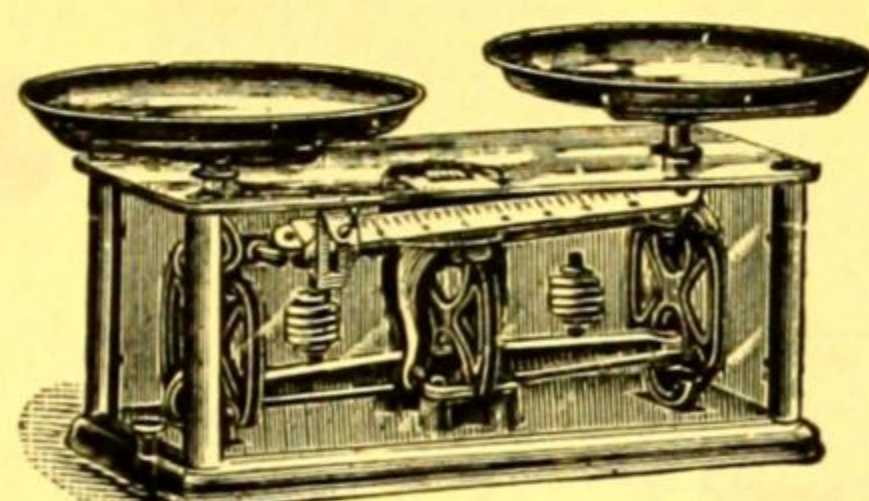
528. **BALANCE, Torsion, Seed Testing,** designed especially for seed analysis and for acidity of corn, as described in Bulletin 102, United States Department of Agriculture. Enclosed in glass case with cover, metal parts nicked throughout. Object pan shaped to form scoop, $4 \times 2\frac{1}{2} \times 1\frac{1}{2}$ inches; weight pan of German silver 3 inches in diameter. Beam inside case graduated to 500 milligrams by 5 milligrams. Capacity, 120 grams; sensibility, 2 milligrams. Dimensions, $13 \times 8\frac{1}{4} \times 6\frac{1}{2}$ inches over all. 65.00



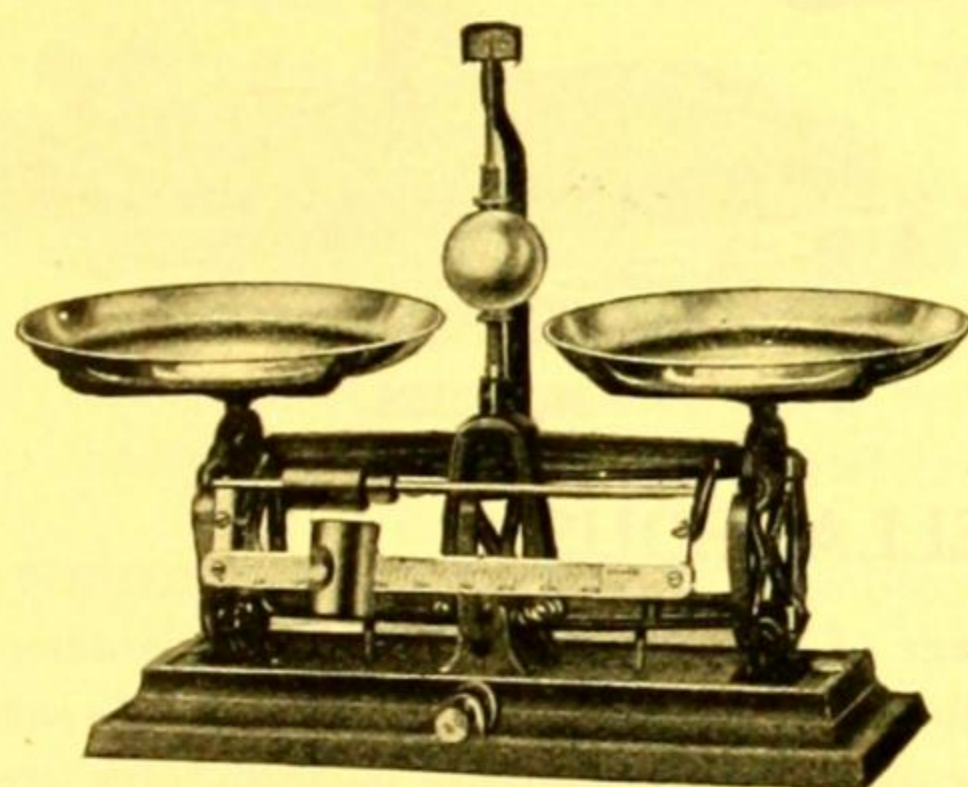
No. 530.



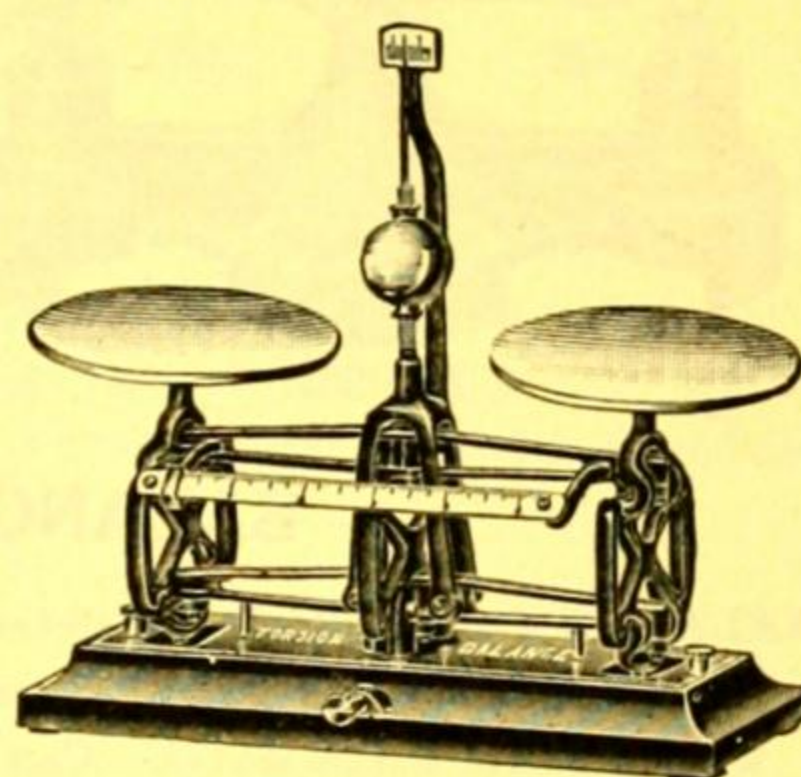
No. 532.



No. 540.

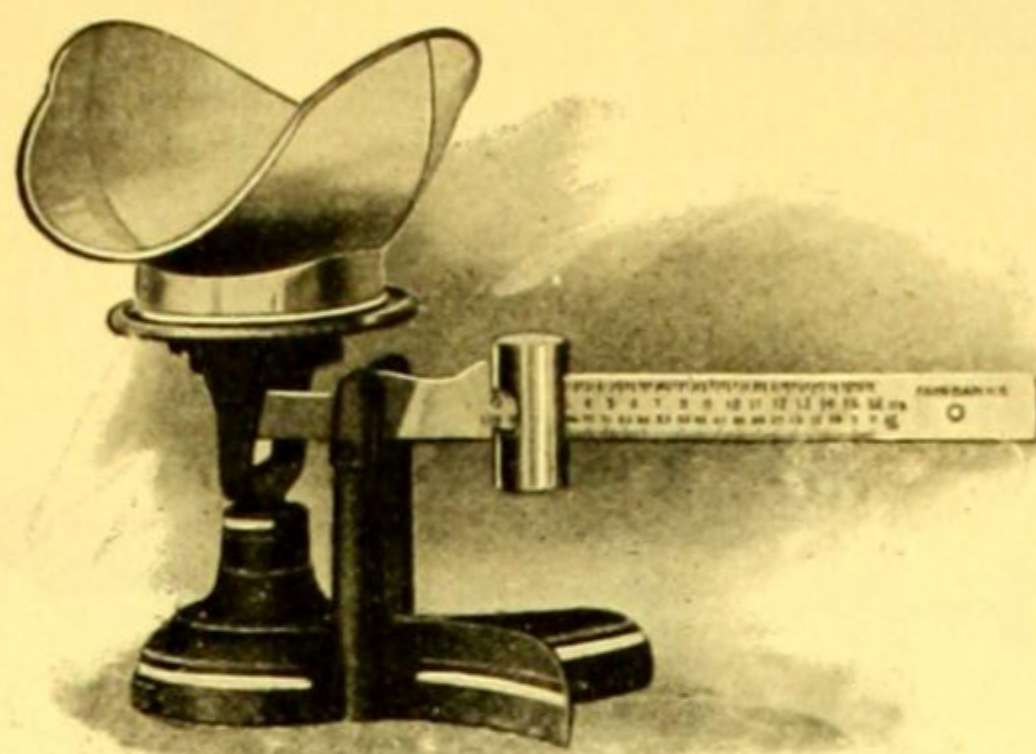


No. 536.

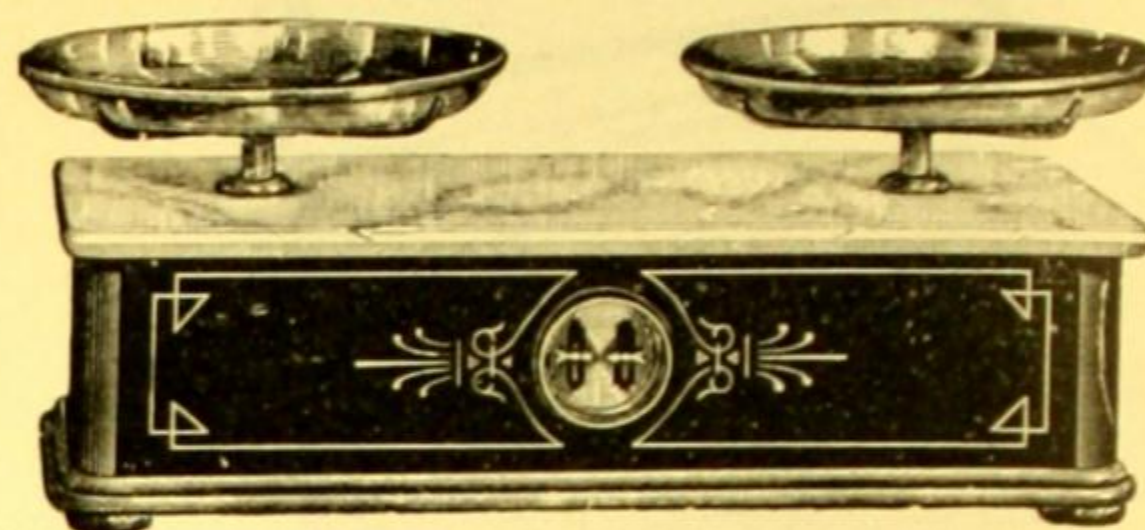


No. 544.

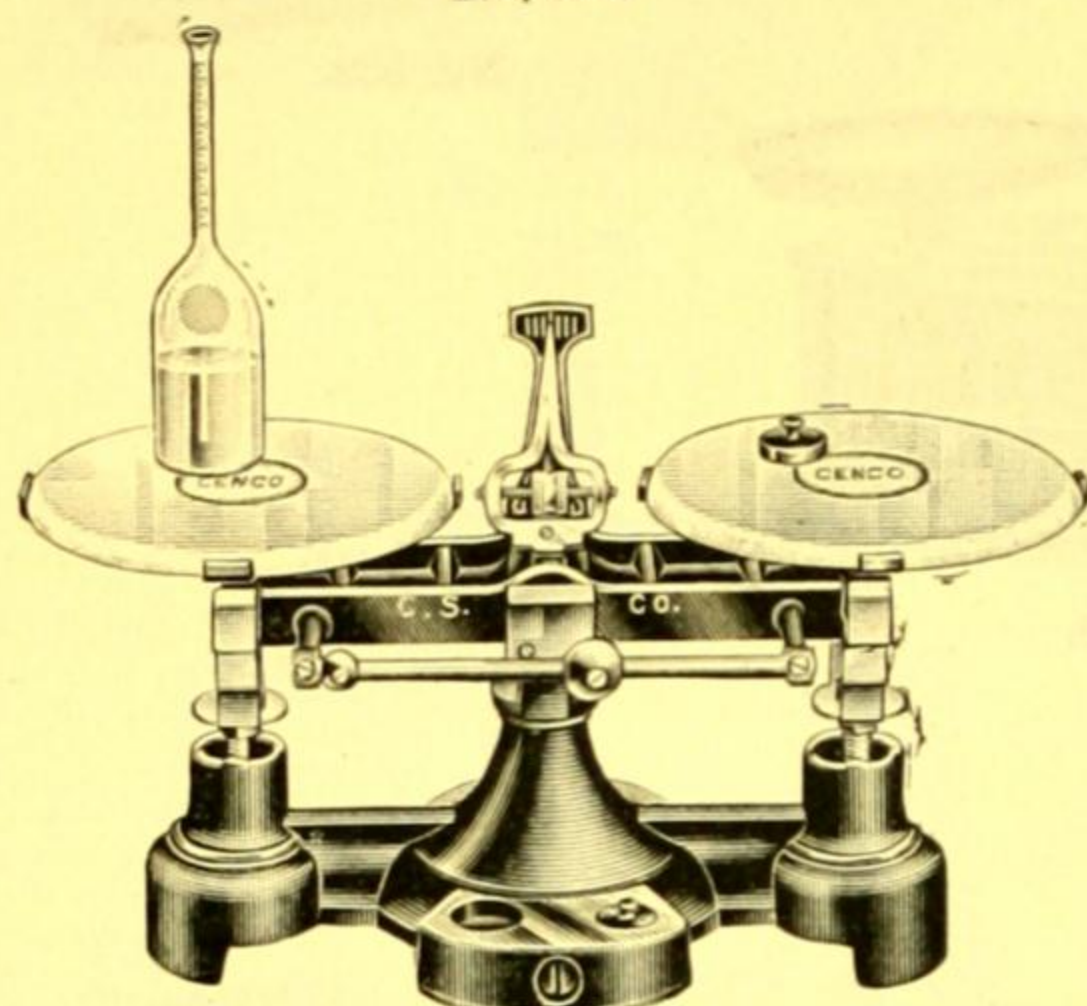
530. **BALANCE, Torsion, Solution or Prescription**, in glass case with cover. Provided with slide beam graduated from 500 to 5 milligrams, with rider operated from outside of glass case. Pans of German silver 3 inches in diameter; capacity, 120 grams; sensibility, 2 milligrams. An excellent balance for use in making up volumetric solutions, or for prescription work. Dimensions, 13 x 6 $\frac{1}{4}$ x 6 $\frac{1}{2}$ inches over all..... \$60.00
532. **BALANCE, Torsion, Solution**, with 9 inch nicked brass pans and slide beam, and with high poise ball and index. Length of beam 12 inches, graduated to 500 grams by 5 grams; capacity of balance, 4 $\frac{1}{2}$ kilograms; sensibility, 15 centigrams 32.00
536. **BALANCE, Torsion, Solution**, same construction and specifications as No. 532, but with counterpoise beam. Bottles, casseroles or beakers may be tared by sliding weight on beam, facilitating weighing and eliminating errors. Capacity, 4 $\frac{1}{2}$ kilograms; sensibility, 25 centigrams 35.00
540. **BALANCE, Torsion, Solution**, in glass and metal case, nickel-plated throughout. Slide beam inside case graduated to 100 grams by 1 gram, with rider operated from outside. Nicked brass pans 9 inches in diameter. Capacity of balance 4 $\frac{1}{2}$ kilograms; sensibility, 20 centigrams. Dimensions, 20 $\frac{1}{2}$ x 9 $\frac{3}{4}$ x 9 $\frac{1}{2}$ inches over all..... 60.00
544. **BALANCE, Torsion, Soil**, with flat porcelain plates, 6 inches in diameter. Slide beam 9 inches in length, graduated to 10 grams by 1/10th. Capacity, 1 kilogram; sensibility, 6 $\frac{1}{2}$ centigrams. High poise ball and index..... 31.00



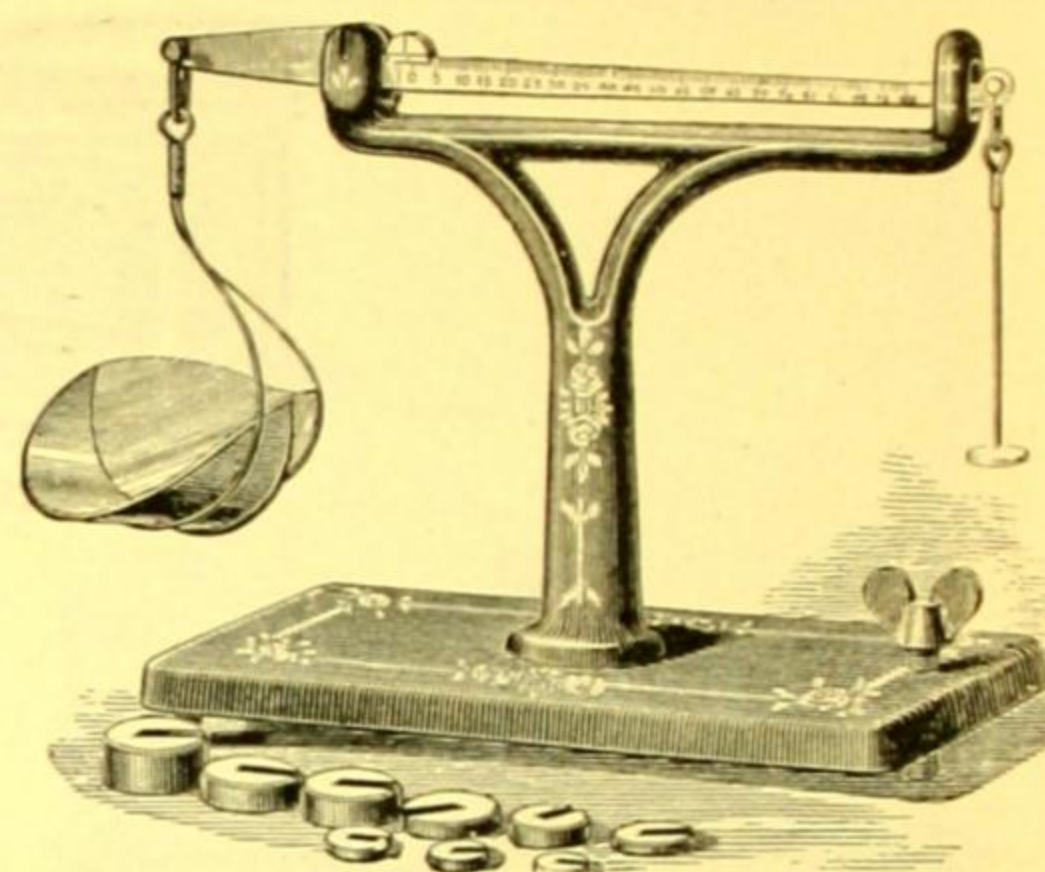
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No. 554.



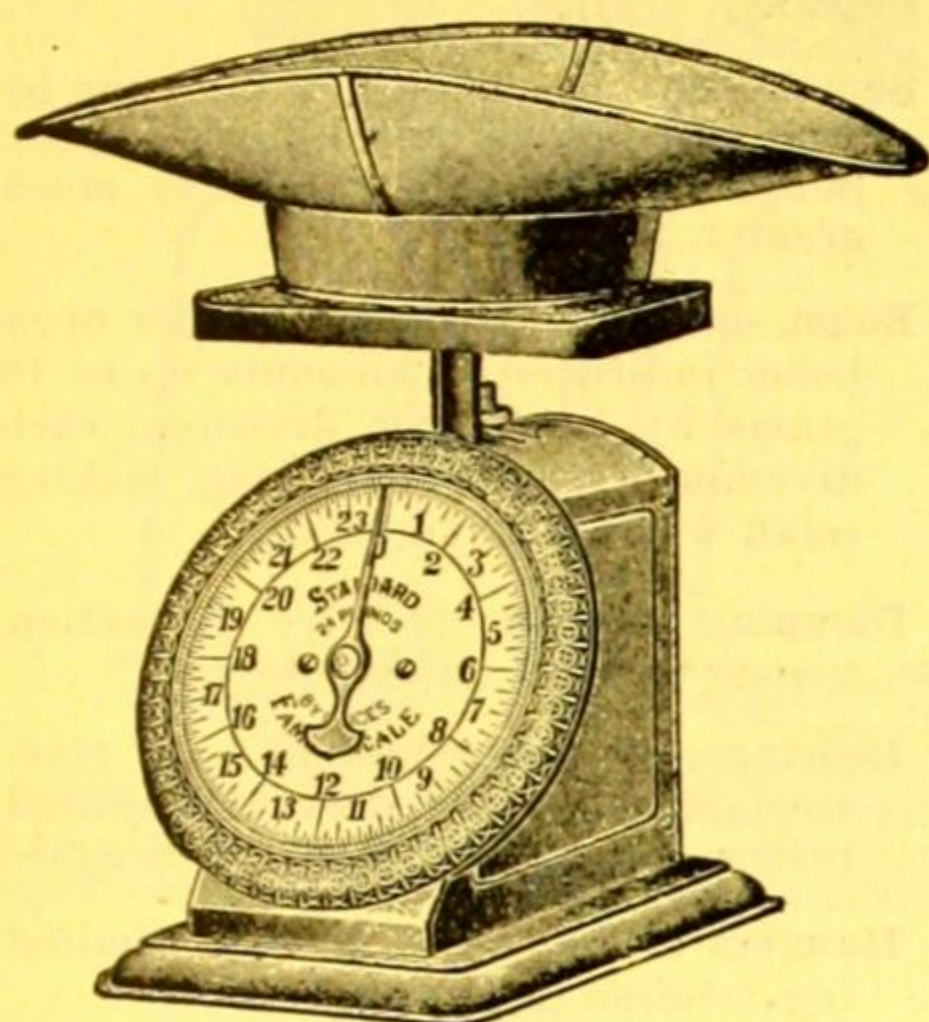
No. 557.



No. 553B.

BALANCES, MISCELLANEOUS

552. **BALANCE, Cement Scale**, for determining percentage of fineness of cement. Beam graduated on upper side to 16 ounces by $\frac{1}{4}$ ounce, lower side to 100% by 1%. Should be used in connection with our No. 12124 sieves. Can also be used for dirt in seed, moisture in grain, ores, etc. Complete with brass scoop..... \$12.00
- 553B. **BALANCE, Cement**, for determining fineness of cement, with beam graduated to weigh to 500 grams by $\frac{1}{100}$ gram divisions..... 19.00
554. **BALANCE, Counter or Dispensing**, in ebony box with marble top and nickel-plated pans.
- | | | |
|-------------------------------|-------|-------|
| No. | 0 | 1 |
| Capacity, lbs. | 5 | 8 |
| Diameter of pans, inches..... | 7 | 8 |
| Sensibility, grains | 20 | 20 |
| Each | 24.00 | 27.75 |
557. **BALANCE, Cream and Milk Testing**, for weighing samples for the Babcock test. This balance is of the same construction as our well known Cenco Agate Bearing Trip Scale, with rigid one-piece beam of aluminum alloy, 6 inch round porcelain plates, hardened steel knives and agate bearings. In place of the usual graduated beam, a round bar is provided carrying a large and small counterpoise for use in balancing the empty milk test bottle. The counterpoises may be locked in place by means of set screws. A polished wooden block is attached to the front of the base, containing 9 and 18 gram weights. The balance is nicely made and well finished. Capacity, one bottle; sensibility, 100 milligrams 15.00



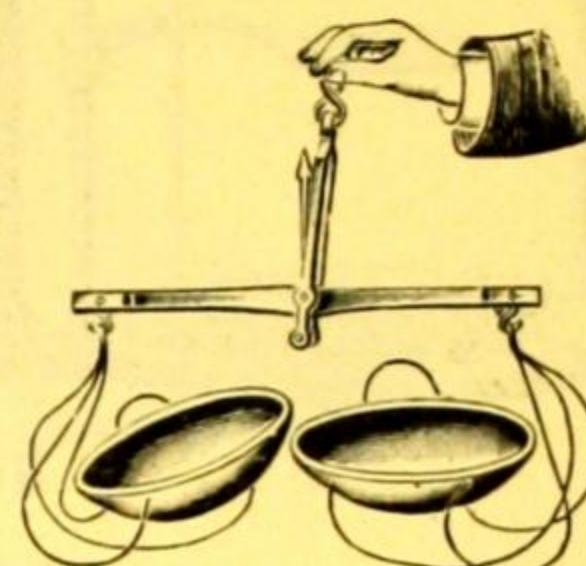
No. 566.



No. 562.



No. 560.



No. 571.

560. **BALANCE, Cream, Wisconsin Hydrostatic.** This balance has been devised to meet the demand for a simple and correct method of weighing cream into test bottles and consists of a specially devised brass float, which is placed in a cylinder of water. Very accurate weighings can be made with this instrument, and as there are no bearings to rust it will retain its sensitiveness indefinitely. Complete with metal cylinder, float and 9 gram weight, but without bottle. \$7.50

561. **WEIGHTS, Extra, for Nos. 557 and 560.**

No.	A	B
Size, grams	9	18
Each	.30	.95

562. **BALANCE, Decimal Milk.** This spring scale is intended especially for use in connection with the Babcock Test for keeping records of the quantity of milk from individual cows, together with the percentage of fat, so as to calculate the butter yield. The scale is provided with a loose pointer, which by means of a thumb screw may be set anywhere on the dial to offset the weight of the milk pail. The readings being in pounds and decimals of pounds makes the calculation very much simpler than when pounds and ounces are given as on the ordinary scale. (Decimal divisions not shown in the illustration.) Capacity, 30 pounds, weighing by 1/20 pound 8.50

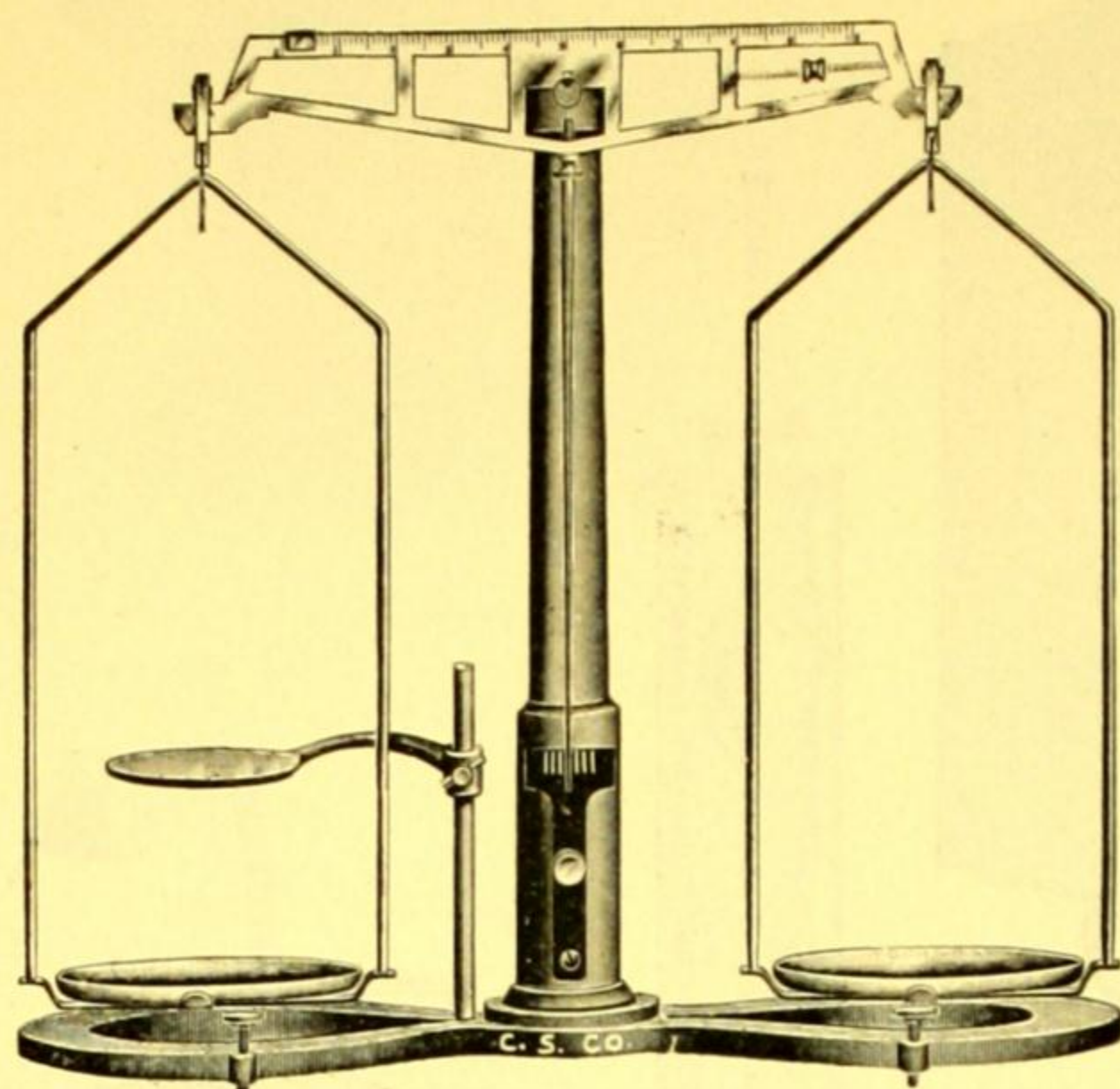
566. **BALANCE, Family Scale, Standard,** with slanting white enameled dial; weighs 24 lbs. by 1 oz. divisions; with square sheet steel platform and tin scoop..... 3.80

568. **BALANCE, Family Scale, Metric.** Same as No. 566, but for weighing 10 kilos by 50 gram divisions 4.50

571. **BALANCE, Hand,** with 7 inch polished brass beam, steel knife edges, and horn pans supported by cords 3.00

CENCO HEAVY-DUTY LABORATORY BALANCES

Agate Bearings.



No. 572.

572. **BALANCE, Laboratory**, designed for those desiring a rugged balance capable of weighing loads up to 2000 grams, yet made with sufficient care to permit a sensibility of 100 milligrams or less.

Capacity, 2 kilos.

Sensibility. Loads up to 2 kilos can be readily weighed within 0.05 grams. Sensibility on light loads is much greater.

Beam, open construction. A rider upon beam indicates all amounts up to 10 grams by 1/10 gram divisions, each division being 2.54 mm long, making small weights unnecessary.

Damping Device, positive in action, brings balance quickly to rest.

Bearings: Knife edges of high grade steel, carefully polished and adjusted, resting in grooves of polished agate.

Hangers of improved design, eliminating friction and wear.

Pan Arrest. The base serves as an arrest, enabling the operator to move balance safely while loaded.

Leveling Screws are supplied, insuring greater sensitiveness.

Plumb Bob, not shown in illustration, makes accurate leveling a simple matter.

Adjusting Screw protected within open work of beam.

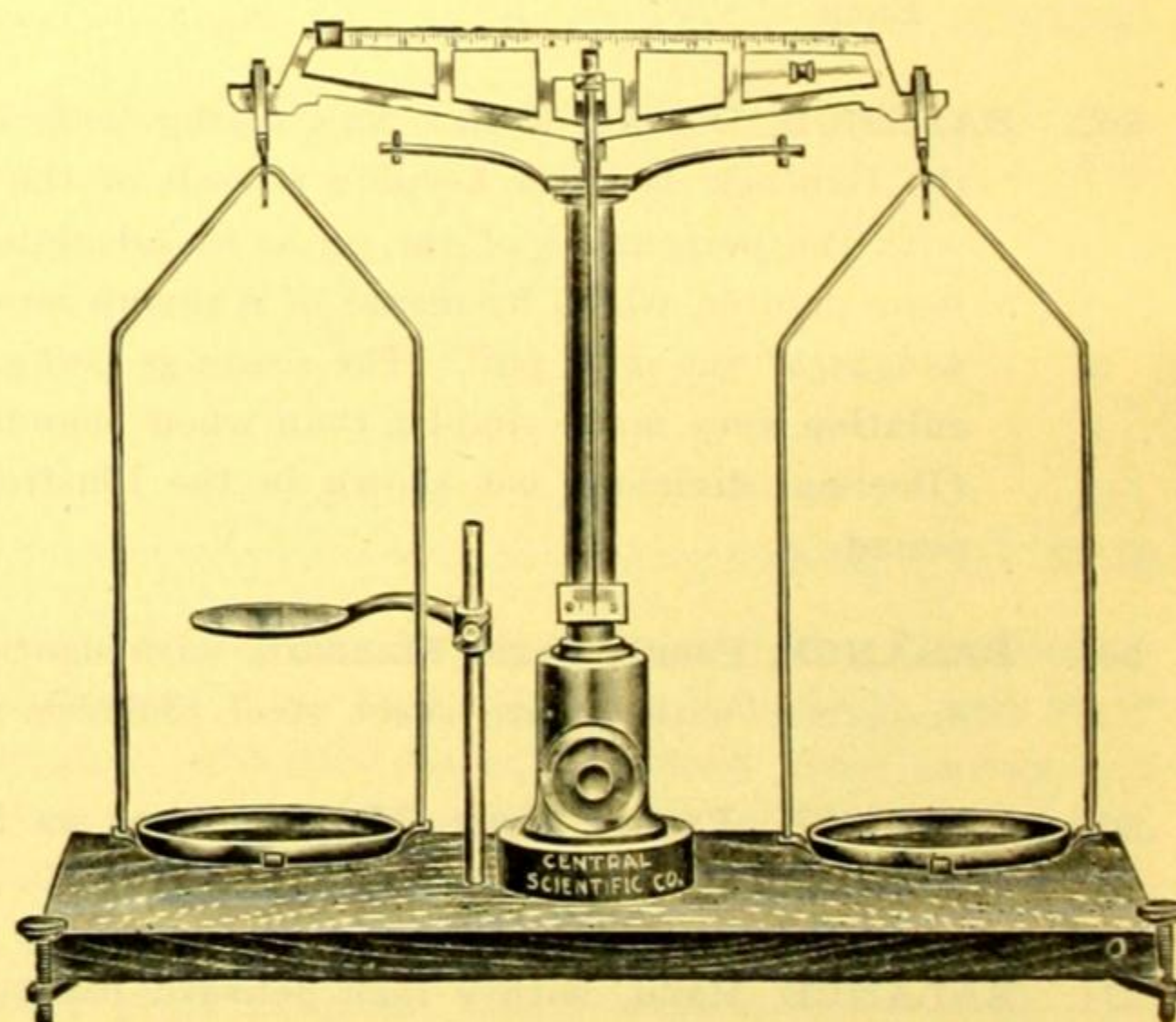
Dimensions. Length of beam between knife edges, 32 cm. Length of graduated part, 25.4 cm.

Pans, of aluminum 14 cm in diameter. Height of balance, 45 cm. Width of bows, 15 cm; height of bows, 35 cm. Pans, bows and stirrups accurately balanced, making them interchangeable.

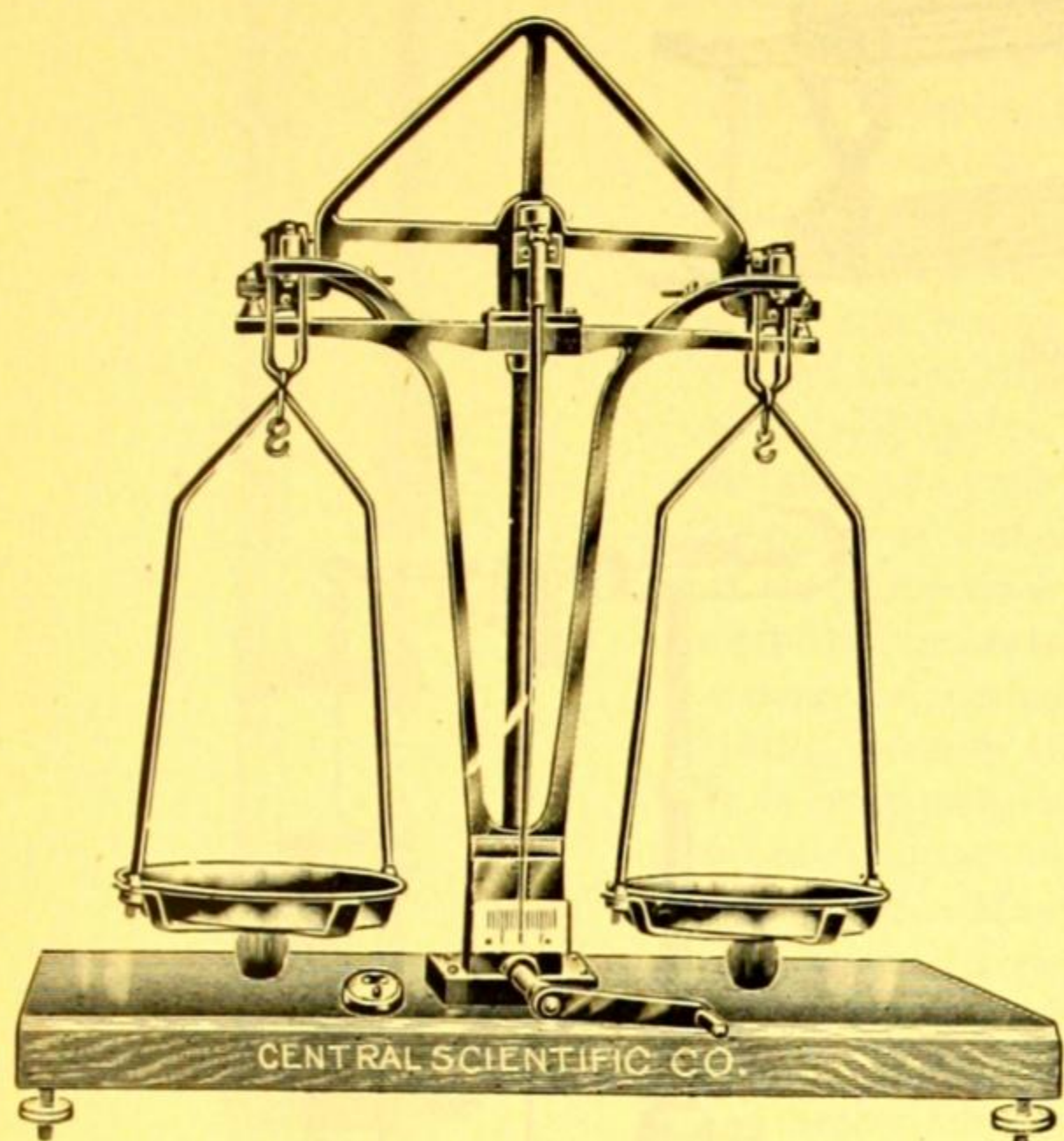
An **Adjustable Shelf** for specific gravity work is included.

Price \$17.50

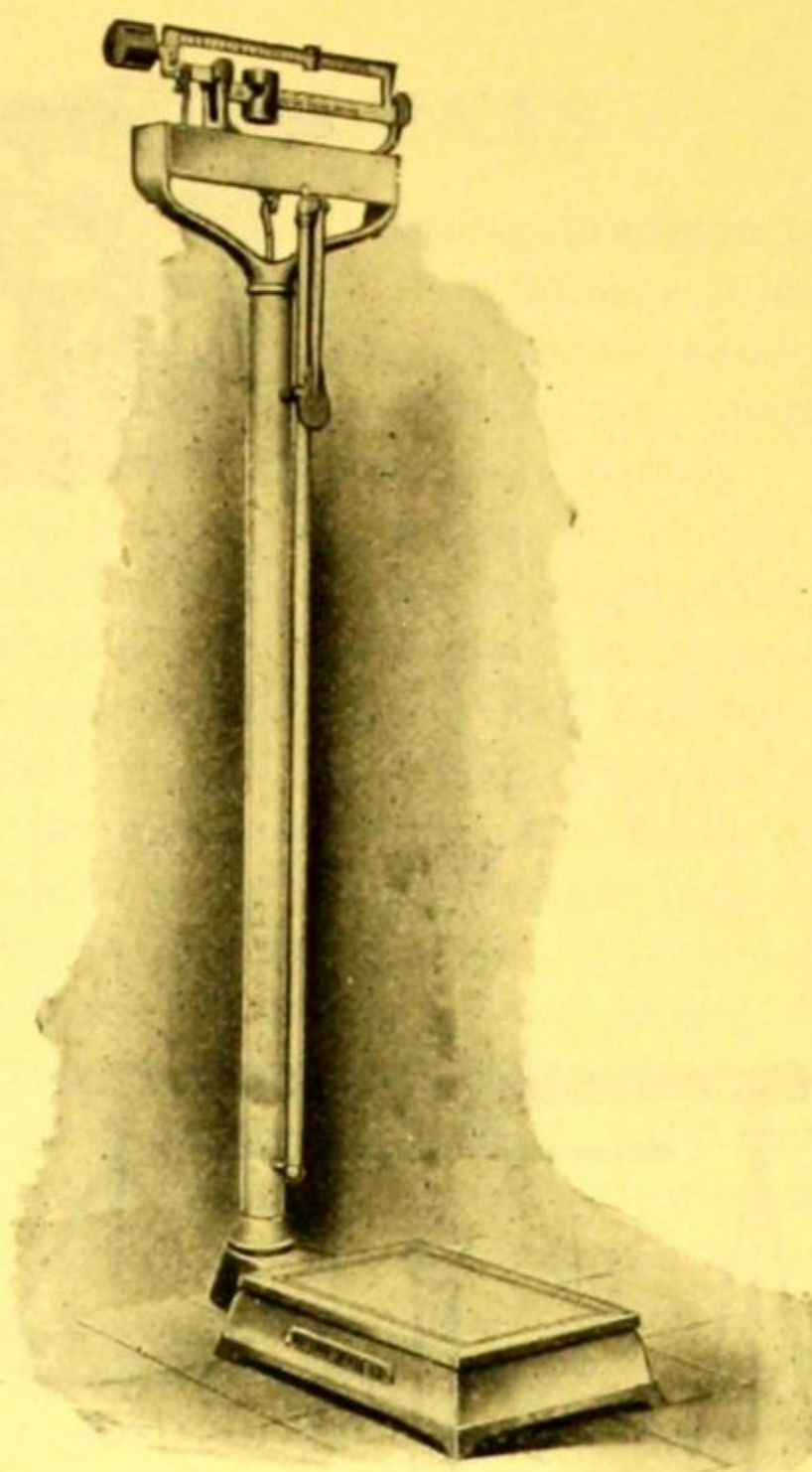
574. **BALANCE, Laboratory**, similar to No. 572, but more sensitive and of better finish and construction. Mounted on polished, mahogany finished base provided with leveling screws. Sliding rider on graduated beam indicates weight up to 10 grams in 1/10 gram divisions. Prismatic steel bearings and grooved agate supports. An eccentric movement operated by knurled head raises beam from beam arrest. Provided with shelf for specific gravity work. Made of brass finely finished; pans of aluminum. Plumb bob and protected adjusting screw as in No. 572. Height of balance, 48 cm; diameter of pans, 14 cm; length of beam (between knife edges), 32 cm. Capacity, 2,000 grams. Sensibility with full load, 30 milligrams or less, which is increased with smaller loads 37.50



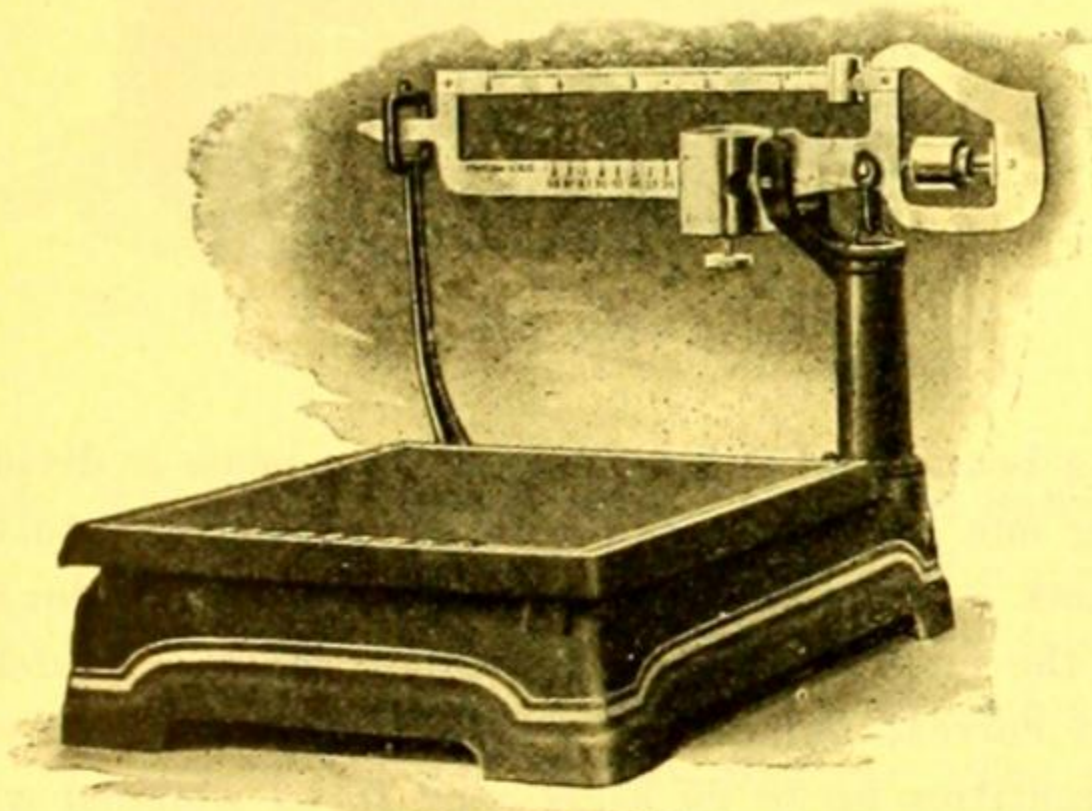
No. 574.



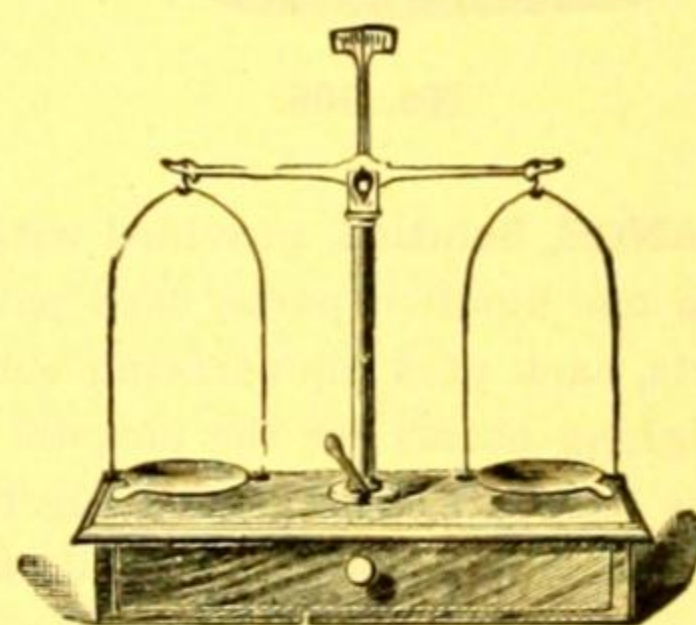
No. 577.



No. 596.

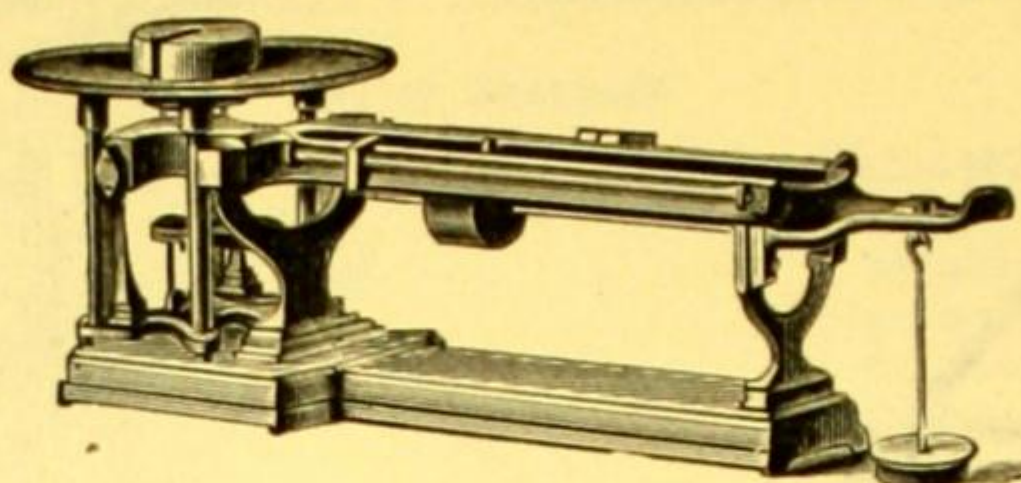


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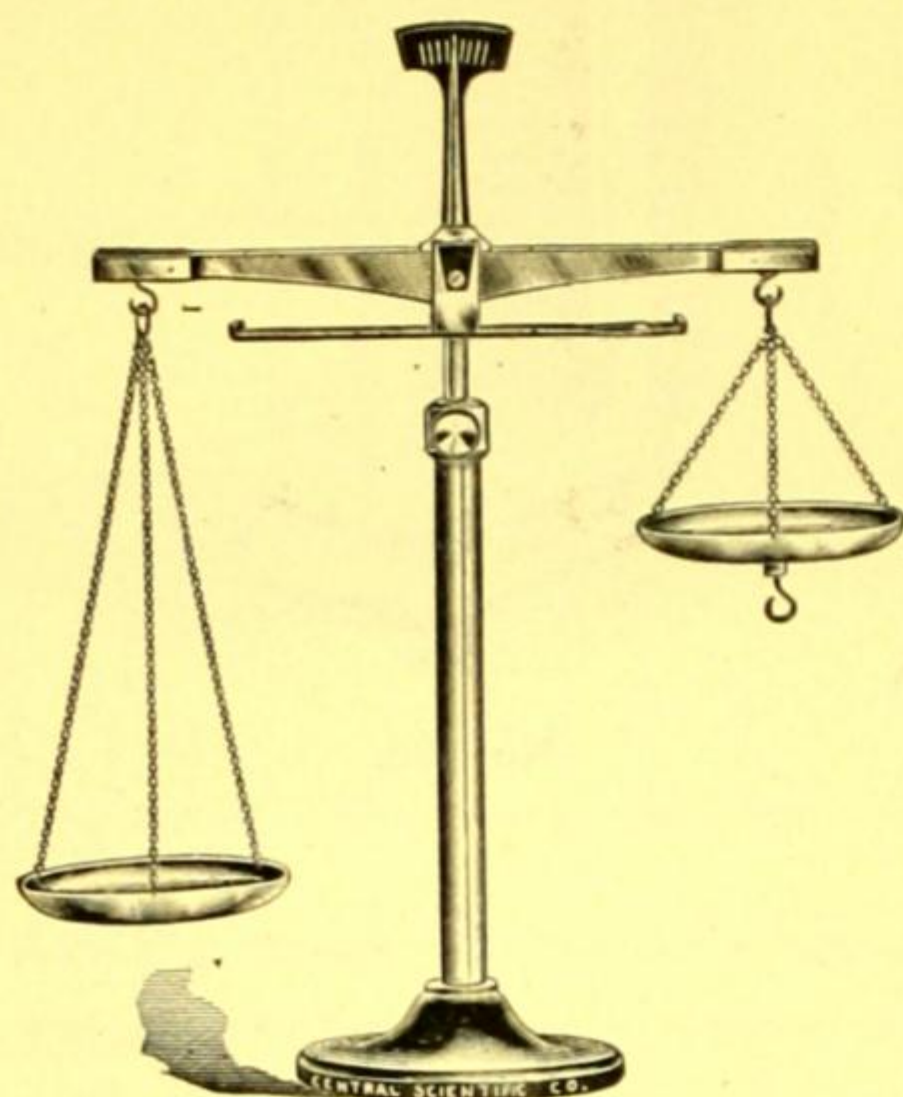


No. 604.

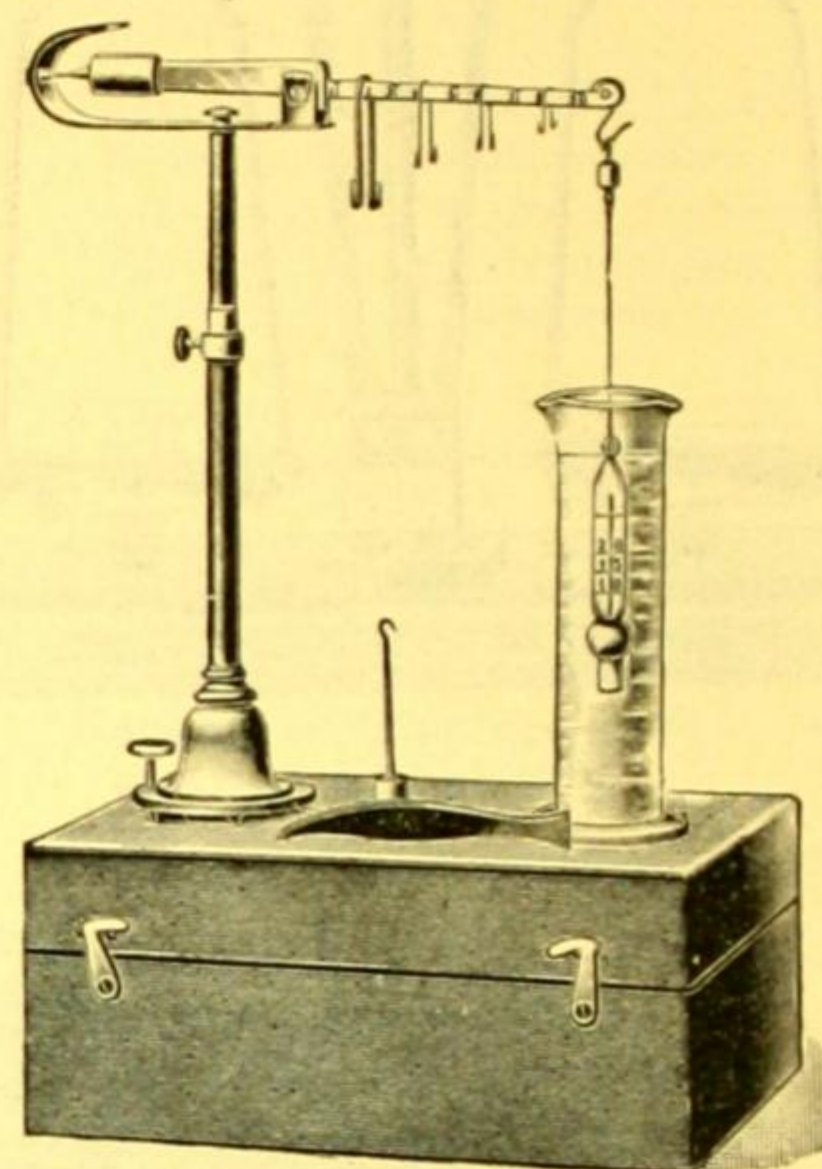
577. **BALANCE, Lecture Table**, a short arm balance of large capacity but high sensibility for use in lecture table demonstrations. The bearings throughout are of agate, the beam is of aluminum, supported by a central pillar of iron finished in black enamel. Arrests are provided to relieve the knife edges from contact when not in use. The removable pans are equipped with brush stops. The balance is mounted on a polished wooden base provided with cross level and leveling screws. Capacity, 3 kg; sensibility, 20 mg; diameter of pans, 19 cm..... \$70.00
584. **BALANCE, Platform, Express Package Scale**, with platform $10\frac{1}{2} \times 12$ inches, with double beam, lower bar graduated to 50 pounds by 5 pounds, upper to 5 pounds by 1 ounce. Finished in maroon, ornamented 24.00
596. **BALANCE, Platform**, for obtaining persona height and weight. Constructed of metal throughout with tall pillar, placing beam on level with eye. Finished in white enamel with nicked beam, graduated to 5 pounds by 1 ounce. Rest of 250 pounds capacity on the counterpoise weights. Platform $10\frac{1}{2} \times 14\frac{1}{2}$ inches, with measuring rod. Complete with weights.... 33.60
604. **BALANCE, Prescription (Army)**, nickel-plated, mounted on a box with drawer with 6 inch beam lifted by a lever. Capacity, 50 grams..... 5.30



No. 606.



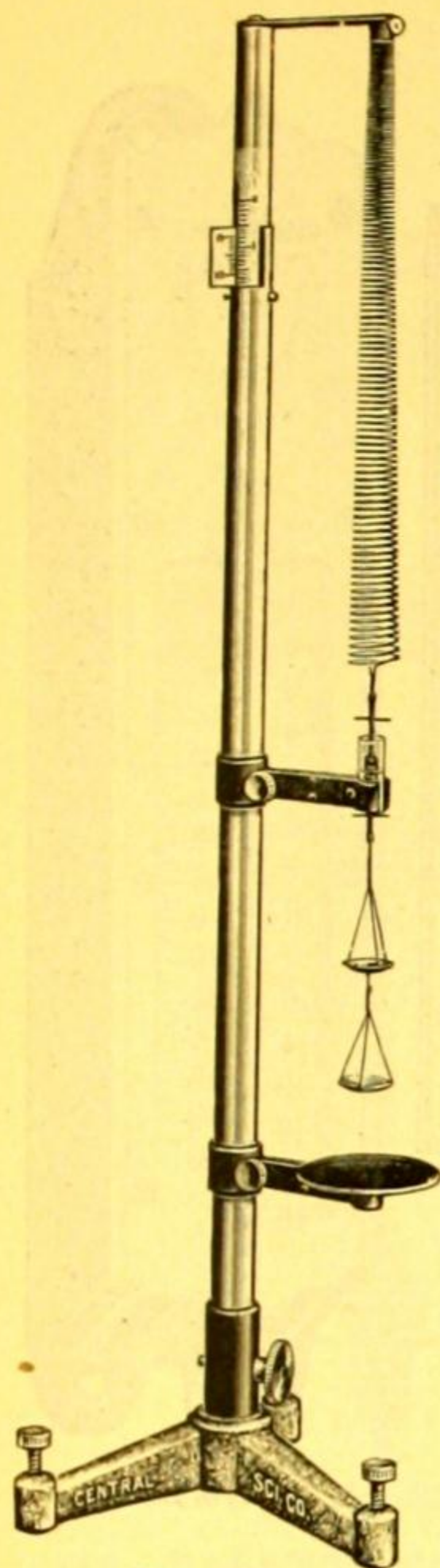
No. 608.



No. 610.

606. **BALANCE, Solution**, provided with two weighing beams and sliding poises. One beam is divided into one hundred parts, each part representing one gram; the other beam is divided into ten parts, each part representing one hundred grams. A bar with sliding poise is placed under the weighing beams for the purpose of balancing the empty bottle or container, which is quickly done by sliding the poise along the bar until a correct balance is secured. This balance will be found indispensable in soil study where quantities up to 20 kilos need to be weighed with accuracy. Sensibility, 1 gram..... \$67.50
608. **BALANCE, Specific Gravity, Hydrostatic**. Excellent for work in specific gravity experiments. Prismatic steel knife edges, adjustable rod supporting beam, and beam arrest. Beam can be so elevated that hook under short pan is 30 centimeters from the table. Mounted on neatly japanned iron base. Length of beam, 25 centimeters; diameter of pans, 10 centimeters; capacity, 200 grams; sensibility, 1 centigram 9.00
610. **BALANCE, Specific Gravity, Westphal Type**. This is a handy and improved form for exact and quick determination of the density of liquids. In polished hardwood box, with Reimann's thermometer sinker having displacement of 5 cc. This balance overcomes all trouble with incorrect hydrometers and forms an easy means for standardizing hydrometers. Complete with 5, 50, 500 milligram, and 5 gram riders, and 15 gram counterpoise 24.00
611. **Thermometer, Extra**, reading from 10° to 30 C., with displacement of 5 cc..... 3.50
612. **Weights, Extra**, for No. 610 Balance, per set, without counterpoise..... 2.50
- 3650B. **Glass Jar, Extra**, for No. 610 Balance..... .35

CENCO JOLLY BALANCES



No. 615.

615. **BALANCE, Specific Gravity, Jolly's Spiral Spring, precision type**, (patented), with vernier reading attachment. This balance is constructed with telescoping tubes, the inner one of which is caused to move upward or downward by means of an internal rack-and-pinion operated by a knurled thumb-screw located at the side near the bottom. The inner tube is graduated for a length of 50 centimeters in tenths, while the outer tube is provided at the top with a vernier, past which the scale on the inner tube slides, enabling the instrument to be read to $1/10$ of a millimeter. Oscillations of the spring are damped by stops striking the ends of the glass tube within which the index moves. A hair line is etched around the glass tube, with which the middle one of the three lines on the index can be readily brought into coincidence enabling accurate and rapid settings to be made. The inner tube has a range of motion of 50 centimeters, which, by the proper choice of a spring, permits the use of this balance for a wide variety of purposes. It is very substantially made and nicely finished, with nickel-plated tubes mounted on a tripod base of japanned iron provided with leveling screws. Many uses may be found for this balance in any laboratory, where quick and accurate determinations of specific gravity must be made. It has become the standard means for determining the specific gravity of rubber and rubber products. Complete with light and heavy spring, special indicator and stops, adjustable platform and aluminum and glass pans..... \$50.00

615A. **INDICATOR** only of No. 615, with glass tube..... 1.50

615B. **GLASS TUBE** only of No. 615A..... .40

618. **BALANCE, Specific Gravity, Jolly's Spiral Spring**, made entirely of metal and nicely finished throughout. The upright is a nickel-plated rod 100 cm long supported by a japanned iron tripod base provided with levelling screws. The platform is of oxidized brass which slides along the rod and can be clamped in any position. The spring support is also adjustable and can be inverted for light loads or heavier springs, allowing a larger range. An adjustable mirror scale 65 cm long, graduated in millimeters, is provided. The pans are of aluminum. Furnished complete with spring No. 628 8.50

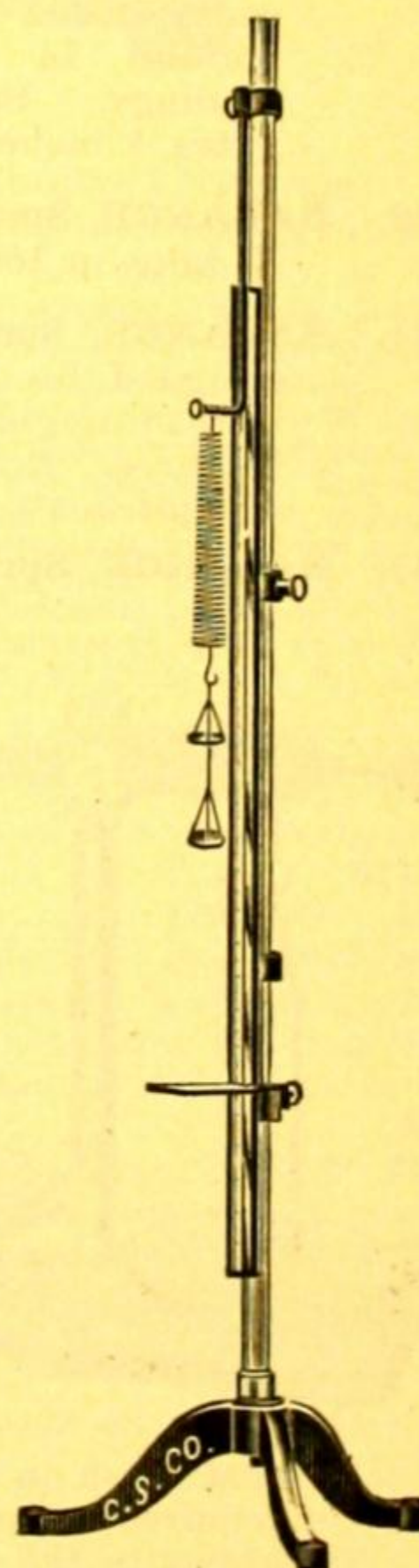
620. **SCALE PAN**, for Jolly's Spiral Spring Balance No. 618. Lower pan of aluminum, with copper wires..... .25

622. **SCALE PAN**, for Jolly's Spiral Spring Balances Nos. 615 and 618. Upper pan of aluminum, with copper wires..... .30

624. **SCALE PAN**, for Jolly's Spiral Spring Balance No. 615. Lower pan of glass, with platinum wires..... 1.00

626. **SPRING** for Jolly's Balances Nos. 615 and 618, light. Elongation per gram, about 5 cm..... .35

628. **SPRING** for Jolly's Balances Nos. 615 and 618, heavy. Elongation per gram, about 0.8 cm..... .35



No. 618.

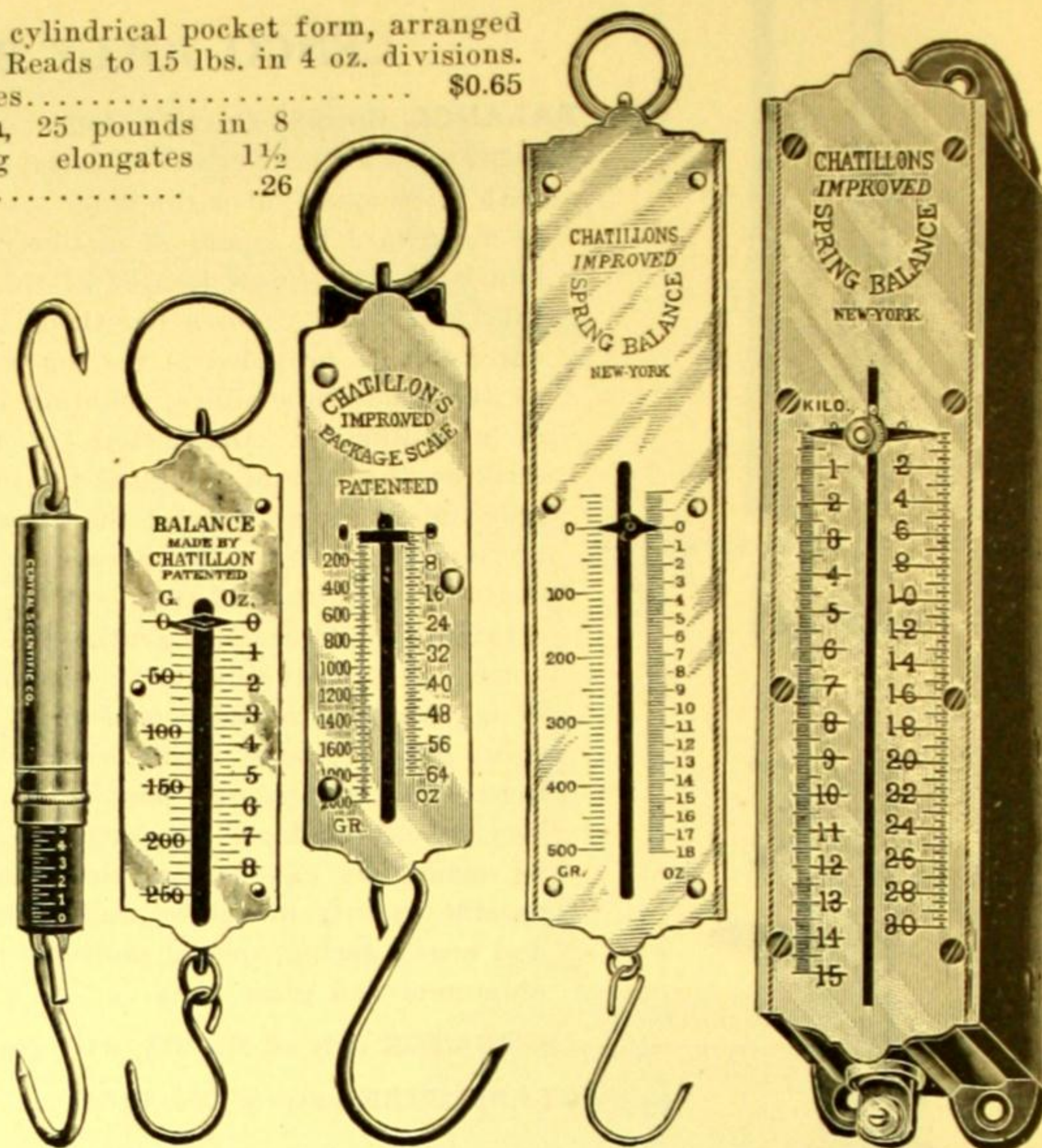
630. **BALANCE, Spring, English**, cylindrical pocket form, arranged to obviate the zero error. Reads to 15 lbs. in 4 oz. divisions. Spring elongates $2\frac{1}{4}$ inches..... \$0.65

632. **BALANCE, Spring, English**, 25 pounds in 8 ounce divisions. Spring elongates $1\frac{1}{2}$ inches..... .26

636. **BALANCE, Spring, English and Metric**, with flat back and broad pointer, for either perpendicular or horizontal reading. Reads to 8 oz. in $\frac{1}{4}$ oz. divisions, and 250 grams in 10 gram divisions. Spring elongates $2\frac{1}{4}$ inches..... 1.30

638. **BALANCE, Spring, English and Metric**, with flat back and broad pointer, for either perpendicular or horizontal reading. Reads to 64 oz. in 1 oz. divisions, and 2,000 grams in 25 gram divisions. Spring elongates $2\frac{1}{4}$ inches..... .80

640. **BALANCE, Spring, English and Metric**. Capacity, 18 oz. in $\frac{1}{5}$ oz. divisions and 500 grams in 10 gram divisions. Has flat back and sharp pointer, and is provided with several divisions above the zero to compensate for the sharp pointer in horizontal readings. Spring elongates 4 inches... 3.80



No. 630.

No. 636.

No. 638.

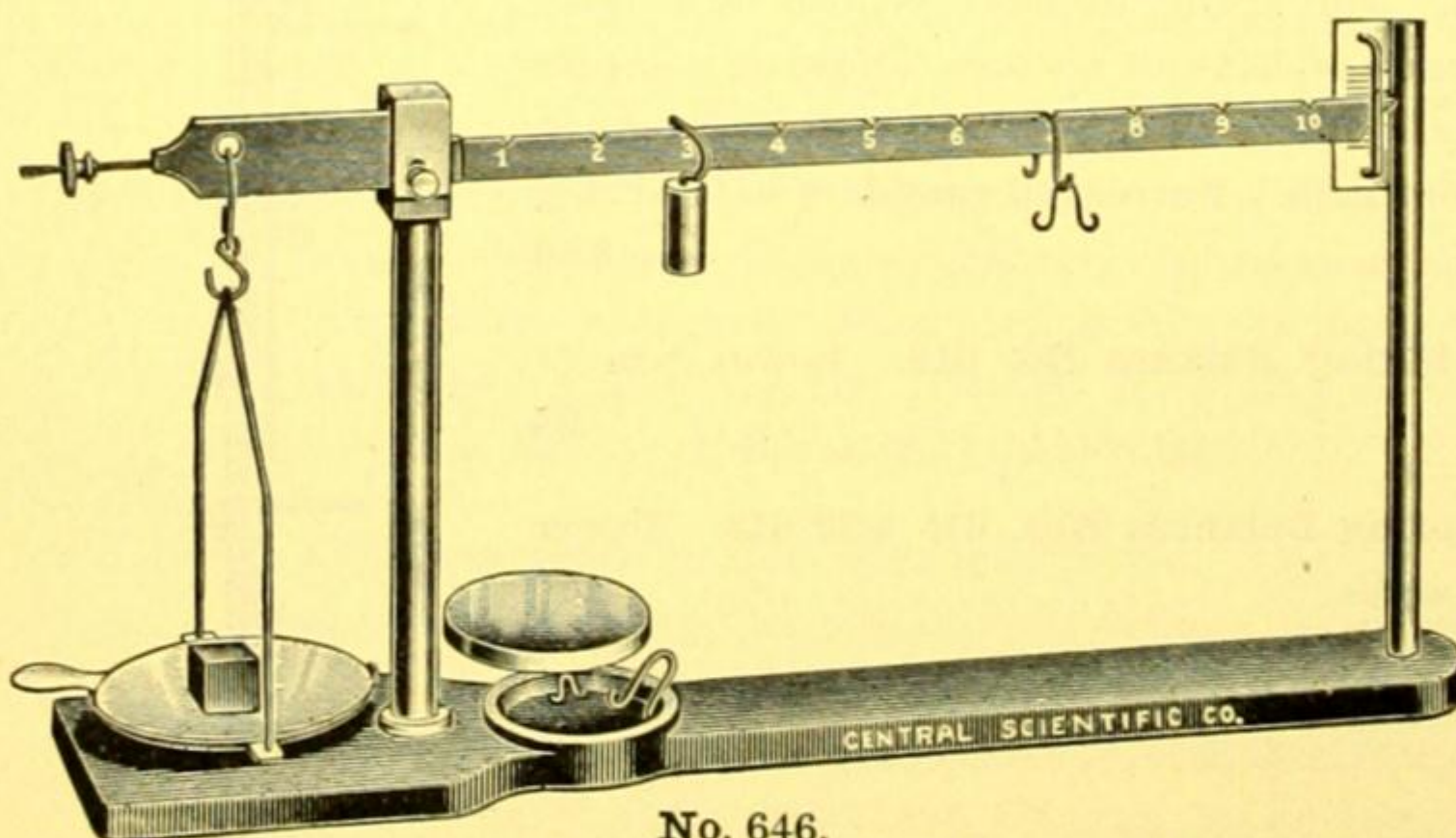
No. 640.

No. 644.

642. **BALANCE, Spring, English and Metric**, with flat back. Reads to 30 lbs. in $\frac{1}{4}$ lb. divisions, and 15 kilos in 100 gram divisions. Spring elongates $5\frac{1}{2}$ inches..... 3.30

644. **BALANCE, Spring, English and Metric**, in iron case with sliding index recorder. Especially designed for experiments in tensile strength, the indicator remaining at the breaking strain, instead of going back to zero when the strain is released, as in the case of the regular spring balances. Reads to 30 lbs. in $\frac{1}{4}$ lb. divisions, and 15 kilos in 100 gram divisions. Spring elongates $5\frac{1}{2}$ inches..... 10.00

645. **BALANCE, Spring**, for mechanical analysis of road material, see page 116.

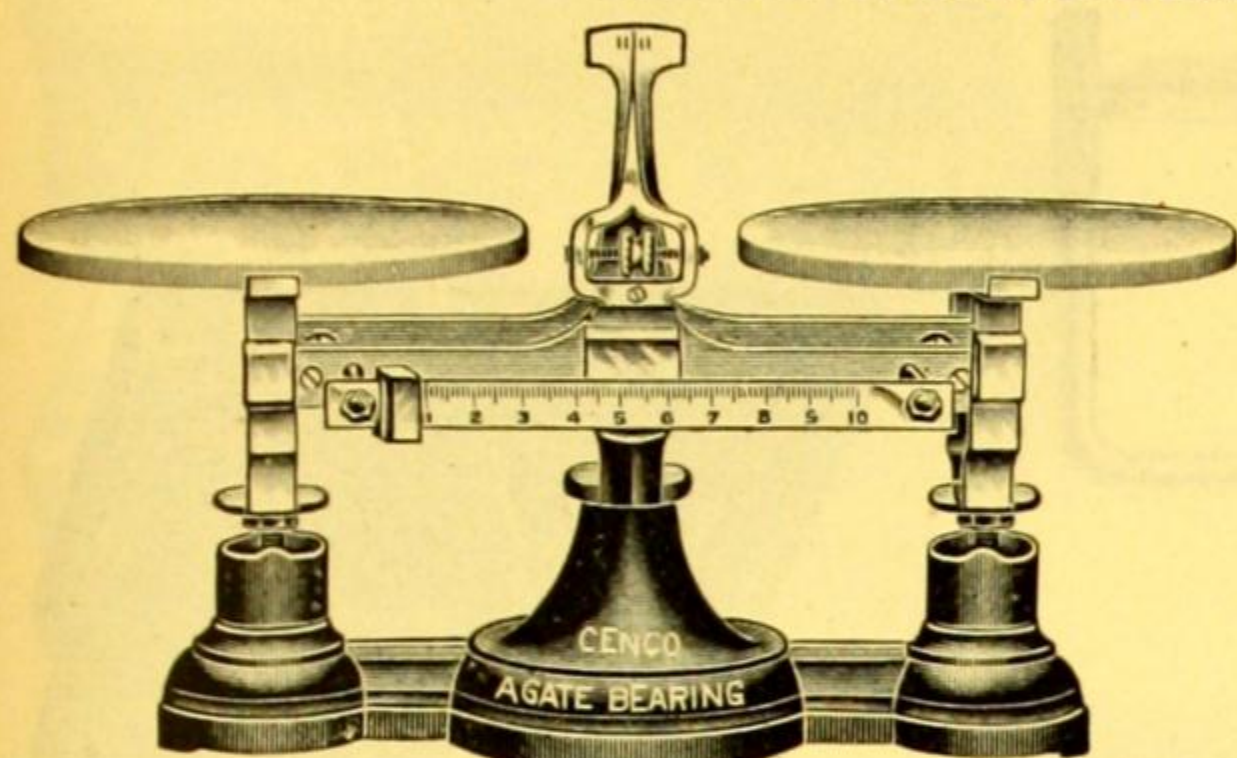


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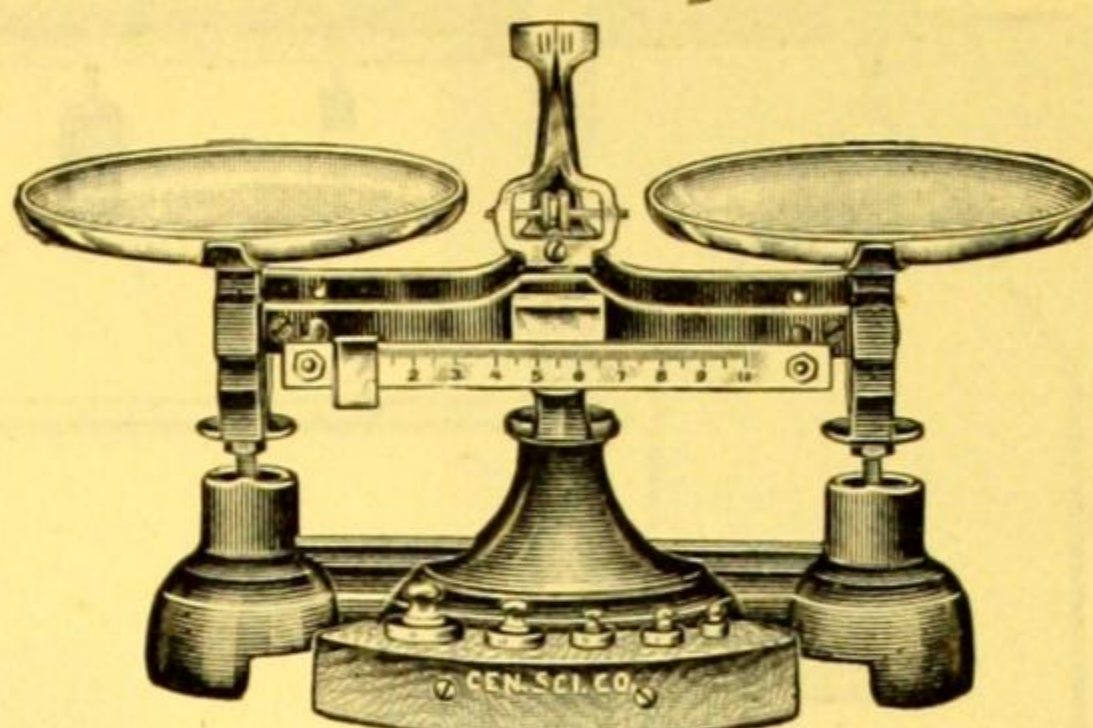
646. **BALANCE, Stoddard Laboratory**, designed by Prof. J. T. Stoddard, Department of Chemistry, Smith College, Northampton, Mass. Capacity, 121 grams; sensibility, less than 1 cg. Especially suited for use in Elementary Chemistry, since it is much more accurate and easy to handle than the Horn Pan Balance, and more durable than the cheap equal arm Chemical Balance.

Five riders are furnished, which weigh 10 g., 1 g., 1 g., 0.1 g., and 0.01 g., respectively, when placed on the first notch on the beam. These values multiplied by the number of the notch give the weight required. For example, the balance in the illustration is in equilibrium with a mass of 37.7 grams in the pan. When not in use the riders are kept in a covered receptacle permanently attached to the base of the balance..... 11.00

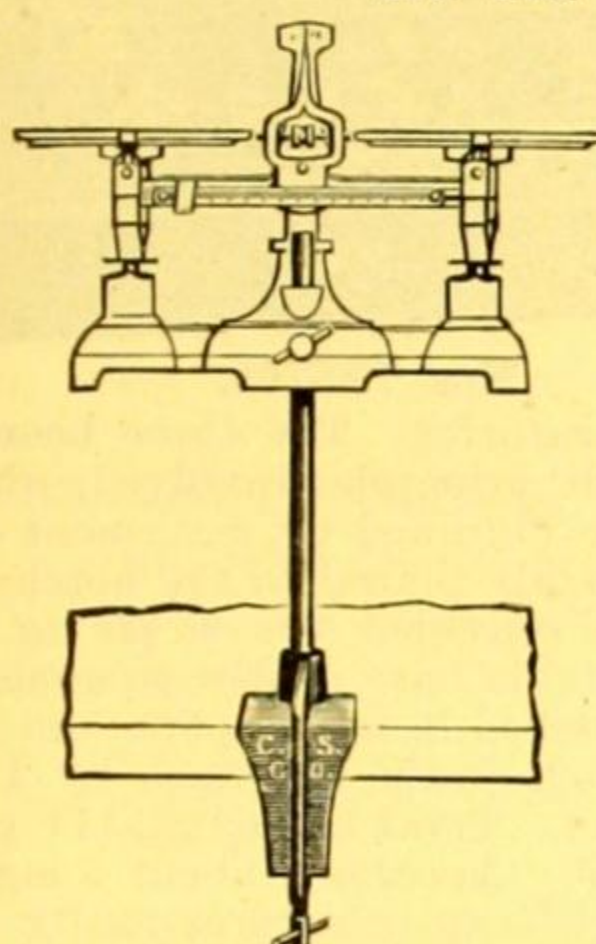
CENCO AGATE-BEARING TRIP SCALES



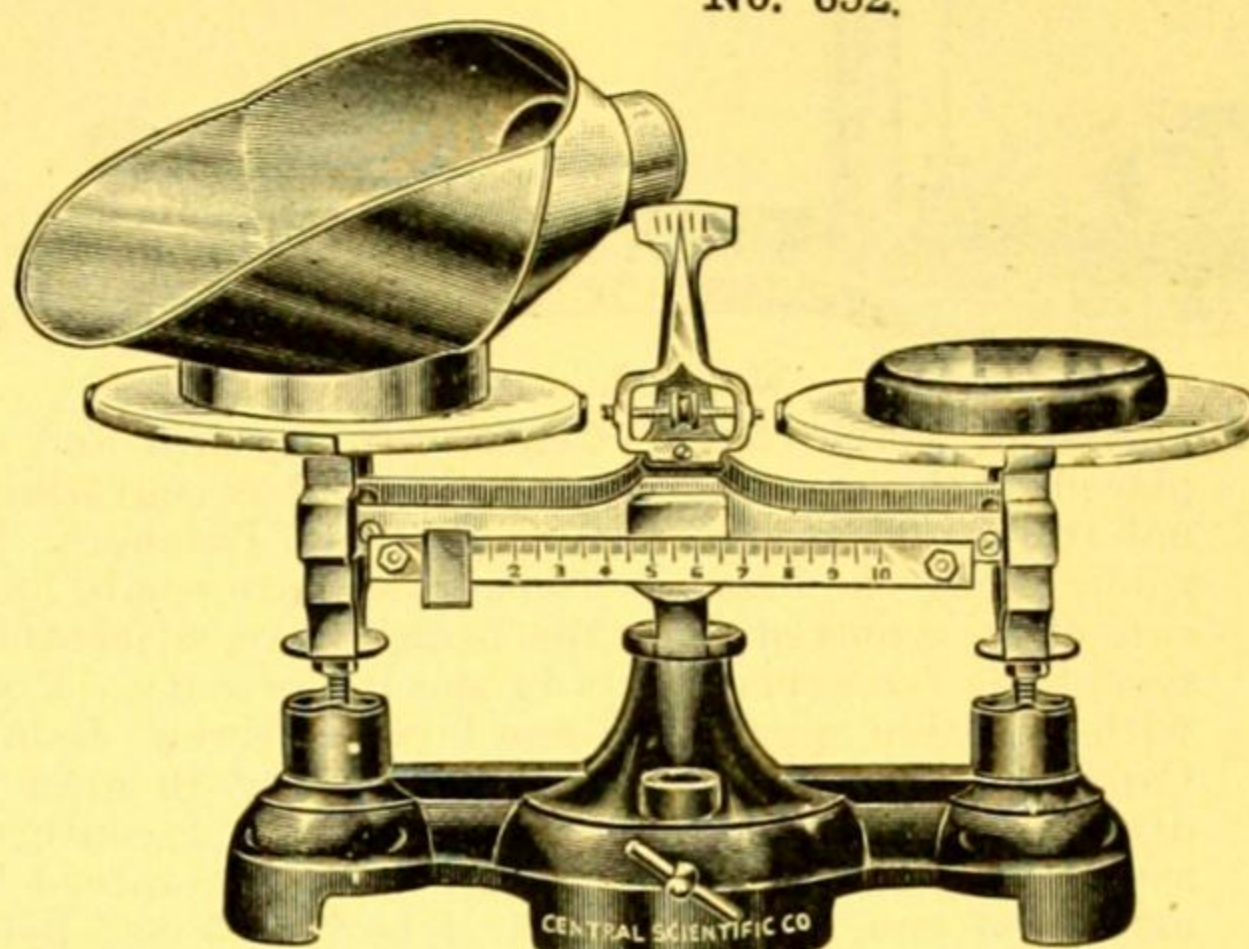
No. 648.



No. 652.



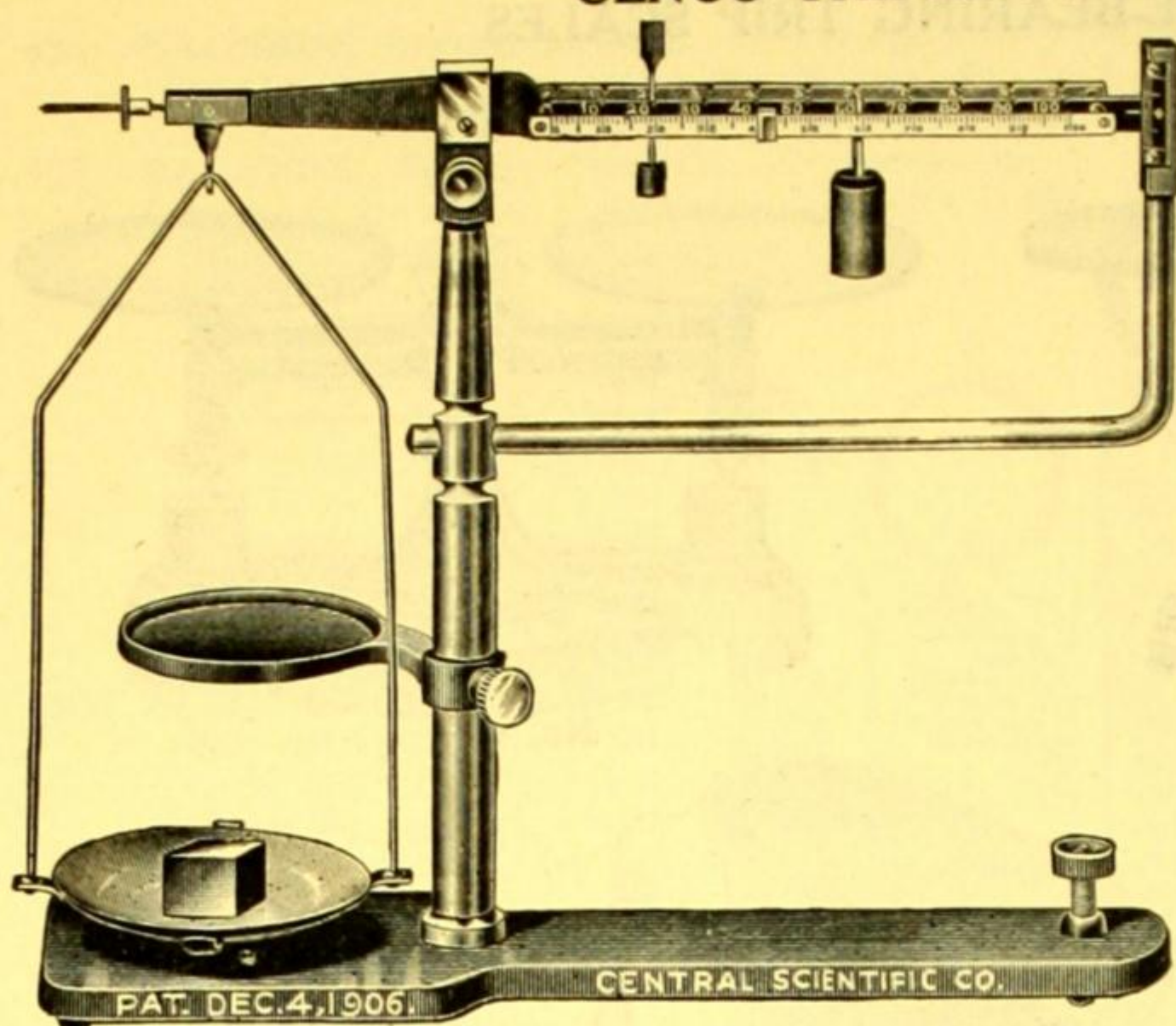
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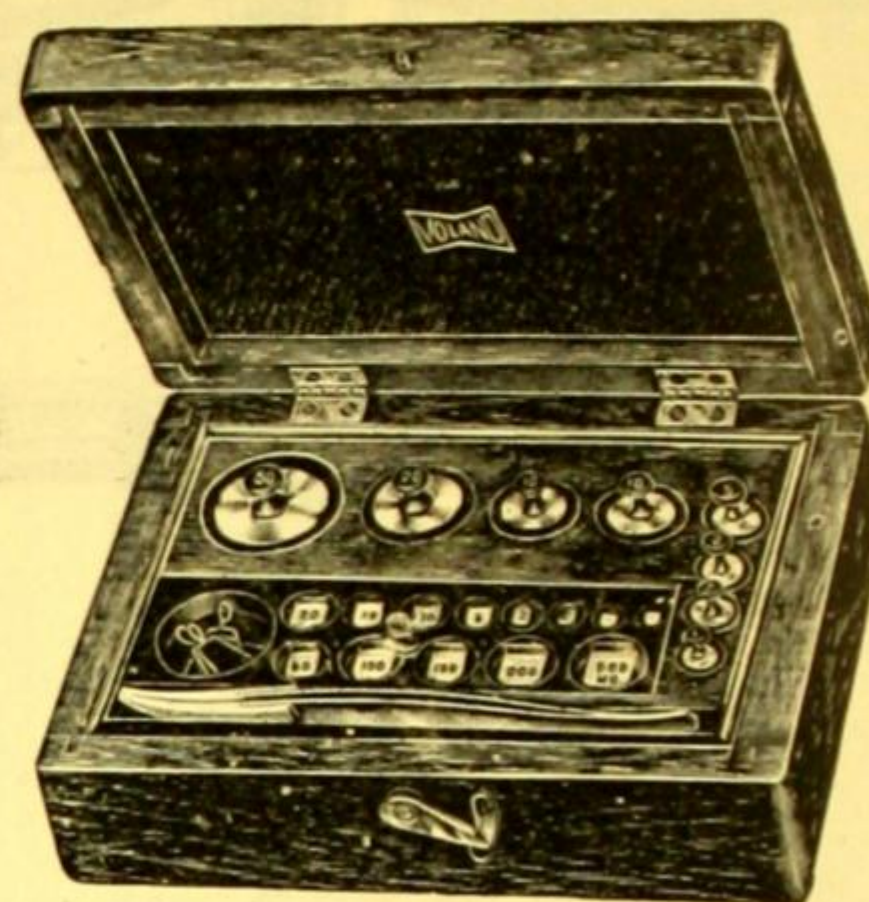
No. 654.

648. **BALANCE, Trip Scale, Cenco Agate Bearing.** Capacity, 2000 grams; sensibility, 1/10 gram. The design of this balance was originally developed by us as a modification of the rugged Harvard trip scale which, while retaining the good features of ruggedness and durability of the latter, would at the same time possess a sensibility and freedom from corrosion which would adapt it for laboratory use. In the original Cenco design the heavy roughly cast iron parts of the Harvard type were replaced by machine-formed parts of brass and steel protected with a non-corrosive coating. Recently these materials in turn have been replaced by an aluminum alloy which combines rigidity with lightness and freedom from corrosion. The hardened steel knife edges and agate bearings are set permanently in place in the metal during the process of forming so that they are always in proper alignment. The steel knife edges are first carefully polished and hardened and then protected against corrosion by a chemical process so that the balance not only possesses an unusually high sensibility but retains it throughout a long life. The only iron part remaining is the substantial base of cast iron which is finished in durable japan baked on at a high temperature. The balance is equipped with 5 1/2 inch round porcelain pans and a beam of nickel-silver with etched graduations. The graduated beam has a range of 10 grams in 1/10 gram divisions. The capacity of the scale is 2000 grams. Sensibility is guaranteed to be 1/10 gram with full load. Actual tests show a much greater sensibility with smaller loads.
- A very convenient feature of our latest design is a hook placed directly below the knife edges of each scale pan, from which heavy objects may be easily suspended for specific gravity work. A set screw is also provided by means of which the balance may be clamped to a 13 mm support rod, and so elevated above the table top..... \$11.00
649. **PORCELAIN PLATES**, extra for No. 648, for replacement per pair 1.30
650. **SUPPORT**, for No. 648 Trip Scale. Consists of a table clamp of special design (No. F197), and a No. F133 Support Rod, 20 cm long. This forms a most convenient means of supporting No. 648 Trip Scale for specific gravity work, as the scale is provided with a set screw for clamping to a support rod, and with specially designed hooks for supporting specimens which are to be weighed under water..... 1.50
652. **BALANCE, Dispensing and Solution Scale**, with Agate Bearings as described under No. 648. This balance will be found ideal for laboratory and pharmaceutical work. The pans are of heavy aluminum, 15 cm in diameter. The graduated beam has a range of 10 grams in 1/10 gram divisions, and brass weights from 10 grams to 100 grams are supplied, conveniently fitted into a projecting holder. Capacity, 2,000 grams. Sensibility is guaranteed to be 1/10 gram with full load; actual tests show a much greater sensibility with smaller loads..... 14.00
654. **BALANCE, Grain Test.** Consists of No. 648 Cenco Agate Bearing Trip Scale with the addition of a funnel scoop and counterpoise, accurately adjusted 15.00
656. **FUNNEL SCOOP AND COUNTERPOISE**, only, of No. 654..... 4.00
- For Weights for use with No. 654 in grading grains, we recommend Set No. 742E, on page 46.

CENCO TRIPLE BEAM BALANCE



No. 658.

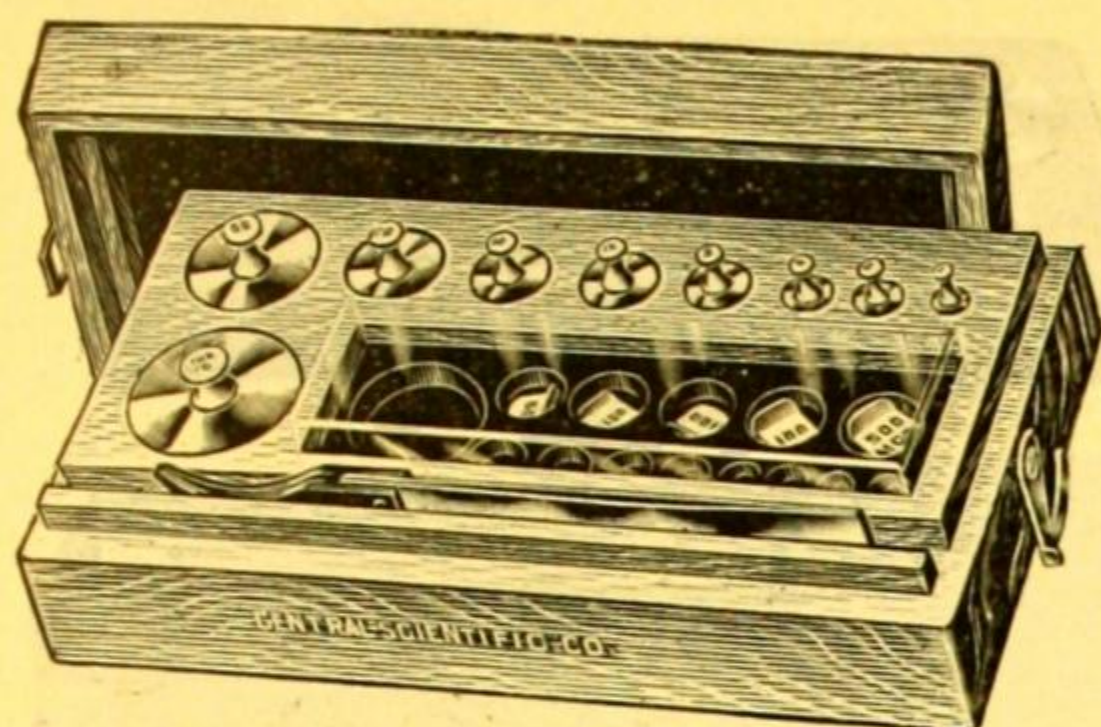


Nos. 700-706.

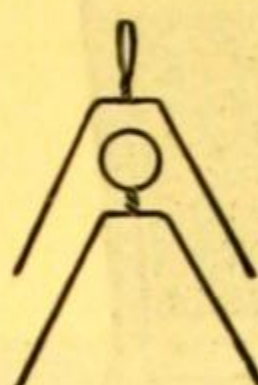
658. **BALANCE, Triple Beam, Cenco**, for physical and chemical laboratories. The three beams are placed in the same horizontal plane, thus conforming to scientific principles involved, which is not true of other styles of Triple Beam Balances. Weighings are obtained by movement of the riders along the beams. These riders are easily handled and quickly placed in the notches, but cannot be removed from the beams. An adjustable support is provided for a jar or other receptacle for experiments in specific gravity. Provided with stable base neatly japanned, and with sensitive spirit level and leveling screw. Balance neatly finished in nickel plate and japan. Capacity of middle beam, 100 grams by 10 gram divisions; back beam 10 grams by 1 gram divisions; front beam, 100 centigrams by 1 centigram divisions. Total capacity, 111 grams; sensibility, with or without full load, guaranteed to 1 centigram. Accuracy, about 5 mg. Diameter of pan, 9.5 cm; width of bow, 10.5 cm; height of bow, 22 cm. Features easily recognized are: rapid weighing, constant sensibility, accuracy, freedom from loss of weights, no interference or breaking of weights. \$17.50
660. **WEIGHT, Extra**, with hook, for use with No. 658, for weighing over 111 grams, but not to exceed 201 grams. Weight must be used only on the 100 gram notch of the middle beam.. 1.50

WEIGHTS, ANALYTICAL

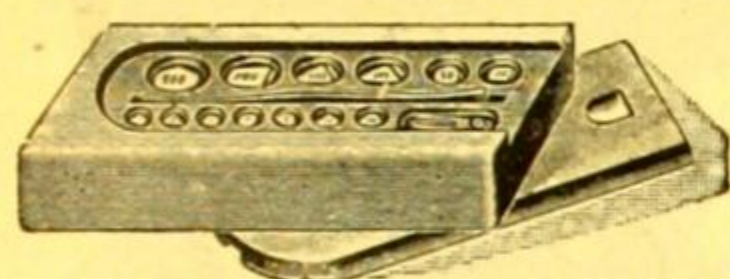
700. **WEIGHTS, Analytical, Gold Plated, Highest Accuracy**, adjusted to meet the requirements of the United States Bureau of Standards, **Class M**. Useful for checking accuracy of other weights. Gram weights made of Tobin bronze, one piece heavily gold plated; fractions of gram of platinum with 3—10 mg riders. In polished mahogany velvet lined box with hinged covers. Furnished with United States Bureau of Standards Certificate. No. A B
Size 1 mg to, grams..... 50 100
Per set 106.00 117.00
702. **WEIGHTS, Analytical**, adjusted within the tolerance of the United States Bureau of Standards for analytical work. All gram pieces are of brass, heavily gold plated. The fractionals from 500 mg to 50 mg are of platinum and from 20 mg to 1 mg of aluminum with 3—10 mg riders. In polished mahogany velvet lined box, with hinged cover, and with forceps. Each weight fitted in separate compartment. No..... B C
Size 1 mg to, grams..... 50 100
Per set 25.00 27.00
703. **WEIGHTS, Analytical, Standard**. These weights are of the same specifications as No. 702, but conform to the specifications of the Bureau of Standards for analytical weights as closely as possible, and have been submitted to the Bureau of Standards for test. Each set is accompanied by a report from the Bureau, but because the requirements of the Bureau are so severe, only an occasional set receives a certificate. Since the report shows definitely their divergence from the theoretical standard, we consider them just as useful for research or control work as are the more expensive standards with certificate. No..... A B
Size 1 mg to, grams..... 50 100
Per set 47.50 52.50
704. **WEIGHTS, Analytical, Standard**, same as No 703, but furnished with United States Bureau of Standards Certificate. No..... A B
Size 1 mg to, grams..... 50 100
Per set 50.00 55.00
706. **WEIGHTS, Analytical**, same quality as No. 702, but carefully lacquered instead of gold plated.
No. A B C D E F
Size 1 mg to, grams..... 20 50 100 200 500 1000
Per set 19.50 20.00 22.50 32.00 38.00 46.00



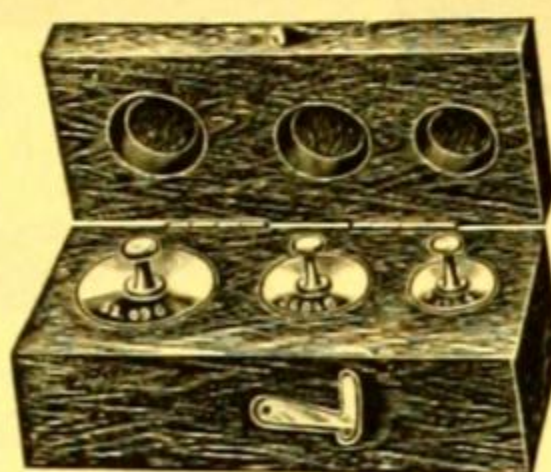
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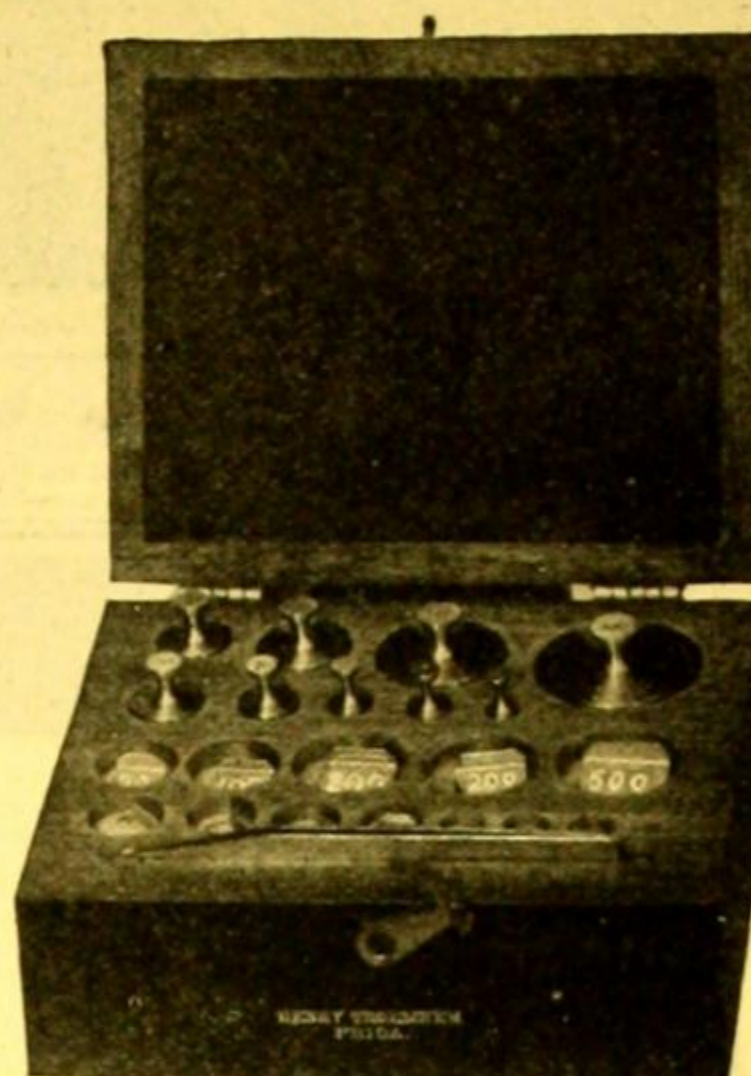
No. 720.



No. 710.



No. 731.



No. 718.

708. **WEIGHTS, Analytical, Precision**, for use with Nos. 450 and 452 Chain Balances. Of lacquered brass, with fractional weights from 500 mg to 50 mg of platinum. Adjusted to within the tolerance of Class S Bureau of Standards. In polished velvet lined mahogany box. Complete with forceps.

No.	B	C
Size 50 mg to, grams.....	50	100
Per set	28.50	31.50

710. **WEIGHTS, Analytical, Fractions of Grams**, of same quality as supplied in above sets. In polished wooden box with slip lid, with separate compartment for each weight. 1-2-5-10-20 mg pieces of aluminum; 50-100-200-500 mg pieces of platinum.....per set 28.00

712. **Weights, Analytical, Fractions of Grams**, same as No. 710, but priced singly.

	Aluminum					Platinum				
Size, mg.....	1	2	5	10	20	50	100	200	500	1000
Each	.30	.30	.30	.30	.30	.75	1.10	2.20	4.50	9.00

718. **WEIGHTS, Analytical**, designed for student use, accurately adjusted. Gram pieces of solid brass, polished and lacquered. No loose balancing material used as all adjustments are made on knob stem. Fractionals of aluminum, the box of natural mahogany with hinged lid, velvet lined, with separate compartment for each weight. A pair of brass forceps is supplied.

No.	A	B
Size 1 mg to, grams.....	50	100
Per set	10.00	12.50

720. **RIDERS, Analytical**, of aluminum, very carefully adjusted.

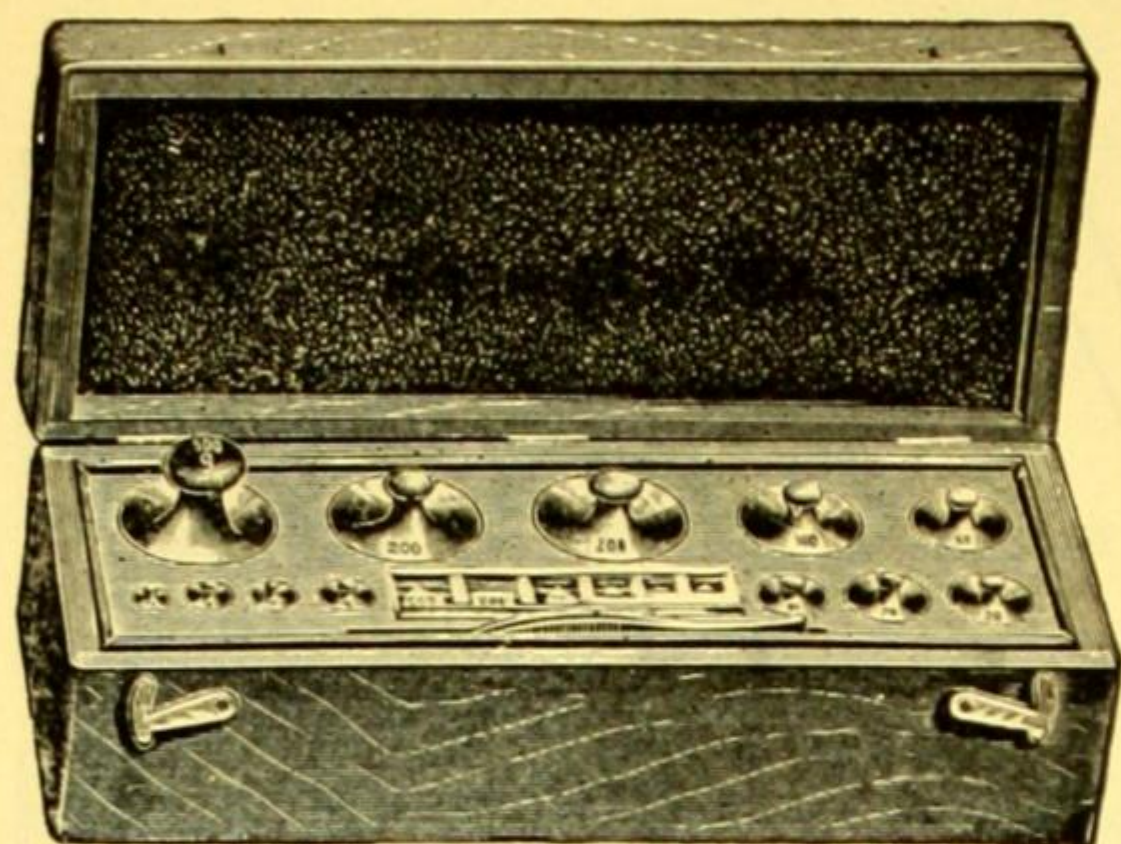
Size, mg.....	12	10	6	5	3	2	1.2	1	.6	.5
Each	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25

726. **WEIGHTS, Factor**, of brass lacquered, for the rapid analysis of iron and steel.

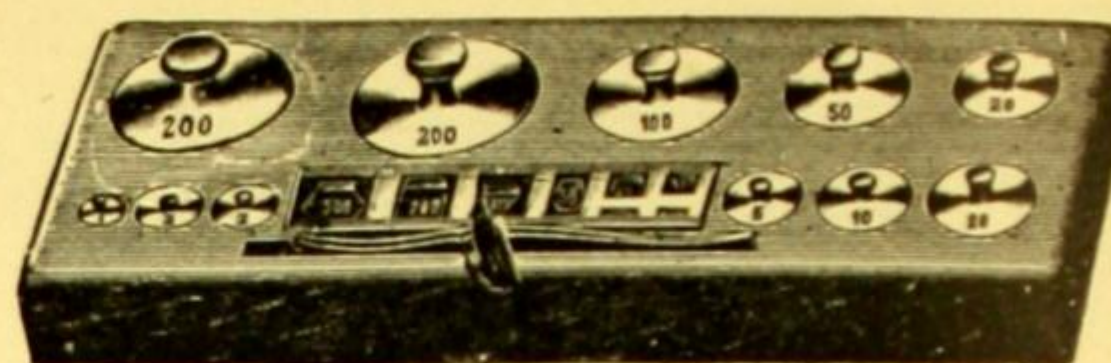
A. Carbon Factor	2.7273 grams	Each	1.80
B. $\frac{1}{2}$ Carbon Factor.....	1.3636 grams	Each	1.80
C. $\frac{1}{4}$ Silicon Factor.....	1.1755 grams	Each	1.80
D. Phosphorus Factor	1.63 grams	Each	1.80
E. $\frac{1}{10}$ Silicon Factor.....	0.4702 grams (platinum)	Each	8.00

731. **WEIGHTS, Normal Sugar**, of brass, lacquered, in mahogany box with hinged lid.

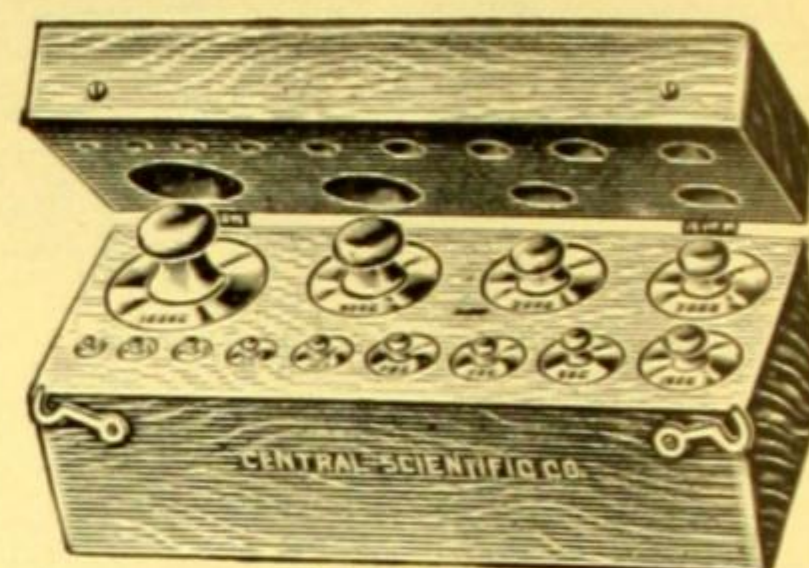
No.	A	B
Set of	2	3
Consisting of, grams.....	13	13
	26	26
		52
Per set	6.00	7.00



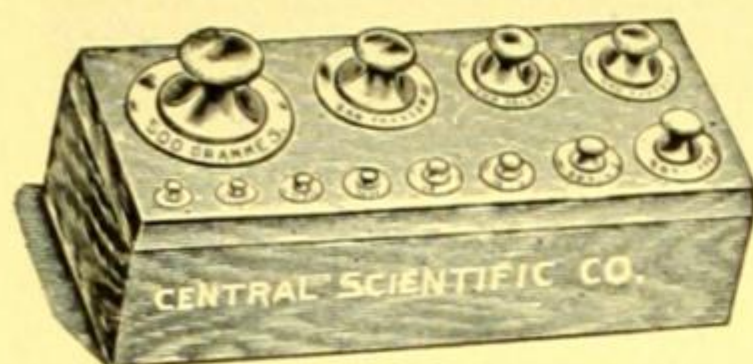
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No. 736.



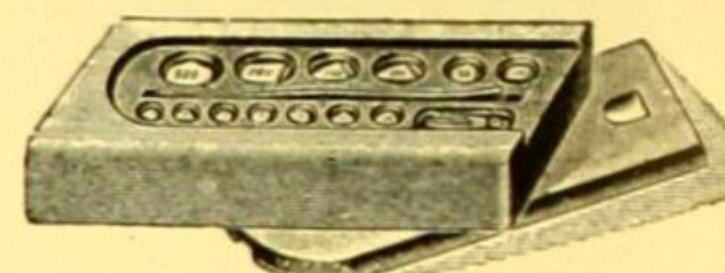
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No. 742.



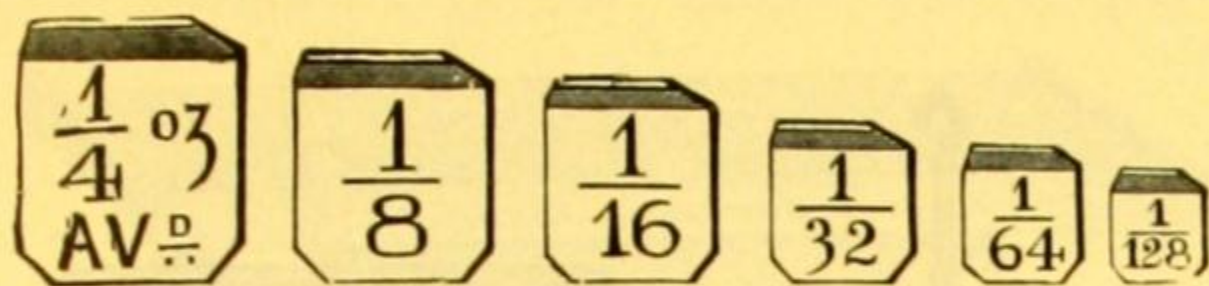
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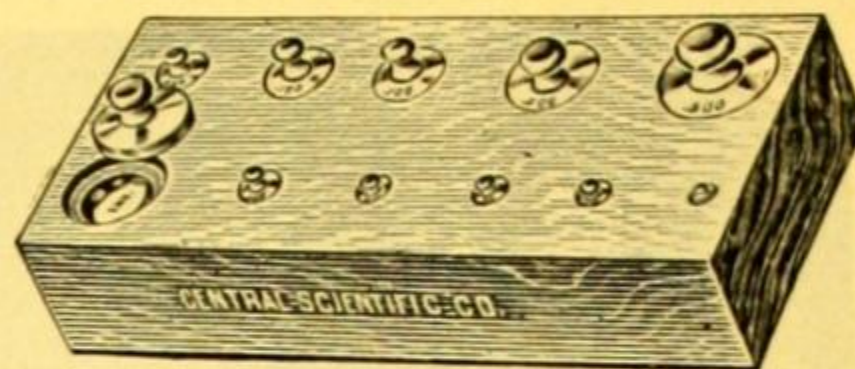
No. 746.

WEIGHTS of MEDIUM GRADE for LABORATORY and TECHNICAL WEIGHING

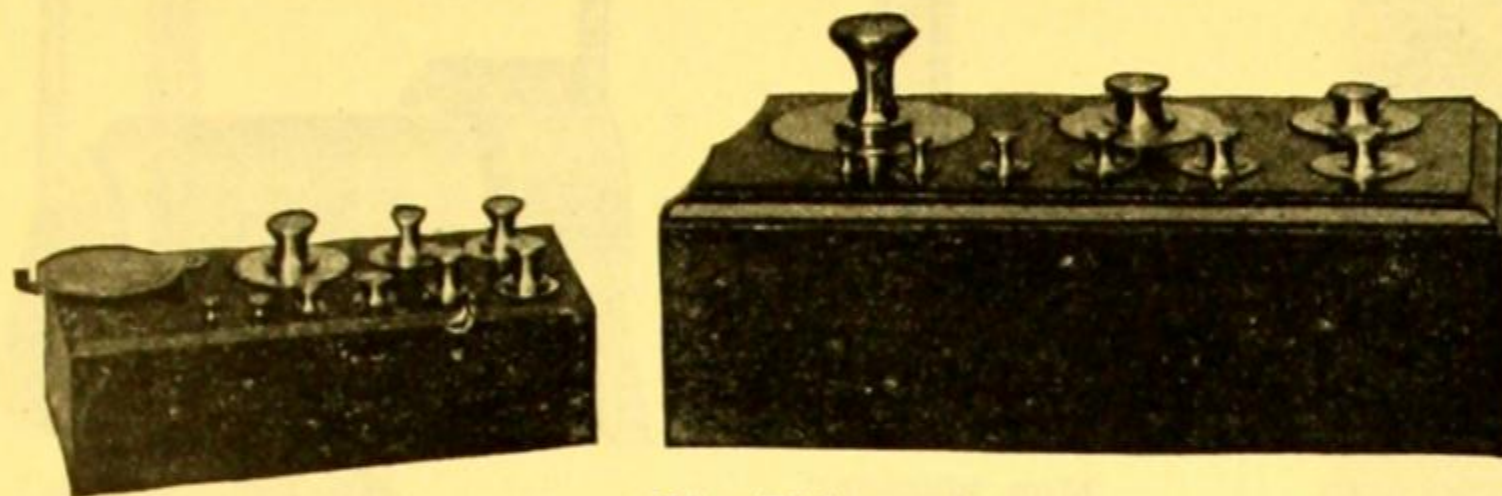
734. **Weights, Medium Grade, Metric**, gram pieces of solid brass, flat shape, heavily lacquered; fractionals of German silver; in polished hardwood box with hinged cover, with forceps; with separate compartment for each weight; fractionals under glass cover.
- | No. | A | B | C | D | E | F |
|---------------------|--------|------|------|------|------|-------|
| Size 1 mg to, grams | 20 | 50 | 100 | 200 | 500 | 1000 |
| Per set | \$4.00 | 4.50 | 5.00 | 7.00 | 9.00 | 13.00 |
736. **WEIGHTS, Medium Grade, Metric**, same quality as No. 734, but in polished hardwood block instead of box, with brass forceps.
- | No. | A | B | C | D | E | F |
|---------------------|------|------|------|------|------|------|
| Size 1 mg to, grams | 20 | 50 | 100 | 200 | 500 | 1000 |
| Per set | 2.00 | 2.50 | 3.00 | 4.50 | 6.50 | 9.50 |
738. **WEIGHTS, Metric**, separate weights, same quality as No. 734 and 736, for replacements.
- | Size, grams | 1 | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| Each | .10 | .10 | .15 | .18 | .20 | .35 | .45 | .80 | 1.70 | 2.80 |
740. **WEIGHTS, Metric**, of polished brass, in hardwood block with hinged cover, suitable for ordinary laboratory work. Nos. A-C are provided with receptacle for the fractional weights which are of German silver. Without forceps.
- | No. | A | B | C | D | E | F |
|---------|---------|---------|----------|---------|---------|----------|
| Size | 1cg-20g | 1cg-50g | 1cg-100g | 1g-200g | 1g-500g | 1g-1000g |
| Per set | 1.30 | 1.50 | 1.90 | 2.80 | 5.00 | 8.00 |
742. **WEIGHTS, Metric**, of brass, same as No. 740, but in hardwood block. Without forceps.
- | No. | A | B | C | D | E | F |
|---------|---------|---------|----------|---------|---------|----------|
| Size | 1cg-20g | 1cg-50g | 1cg-100g | 1g-200g | 1g-500g | 1g-1000g |
| Per set | 1.00 | 1.30 | 1.70 | 2.30 | 4.00 | 6.50 |
- WEIGHTS, Metric, Brass**, same grade as Nos. 740 and 742, separate for replacements in other sets.
- | Size, grams | 1 | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| Each, flat form | .09 | .09 | .13 | .16 | .18 | .32 | .42 | .75 | 1.50 | 2.50 |
| Each, tall form | .08 | .08 | .10 | .15 | .15 | .30 | .40 | .70 | 1.40 | 2.60 |
746. **Weights, Metric, Fractional**, of German silver and aluminum. Set 1 to 500 milligrams, with duplicates of 2, 20 and 200 milligram pieces, in covered hardwood box with sliding cover. Each weight in a separate compartment; with brass forceps.....per set 2.00
748. **WEIGHTS, Metric, Fractional**, of German silver and aluminum, put up in sets of 1 mg to 500 mg with duplicates of 2, 20 and 200 mg pieces; in pasteboard box.....per set .50
750. **WEIGHTS, Metric, Fractional, Single**, same as No. 748, for replacements.....each .05



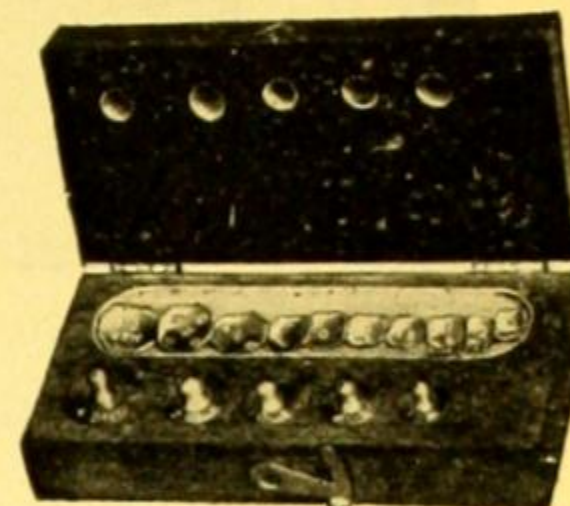
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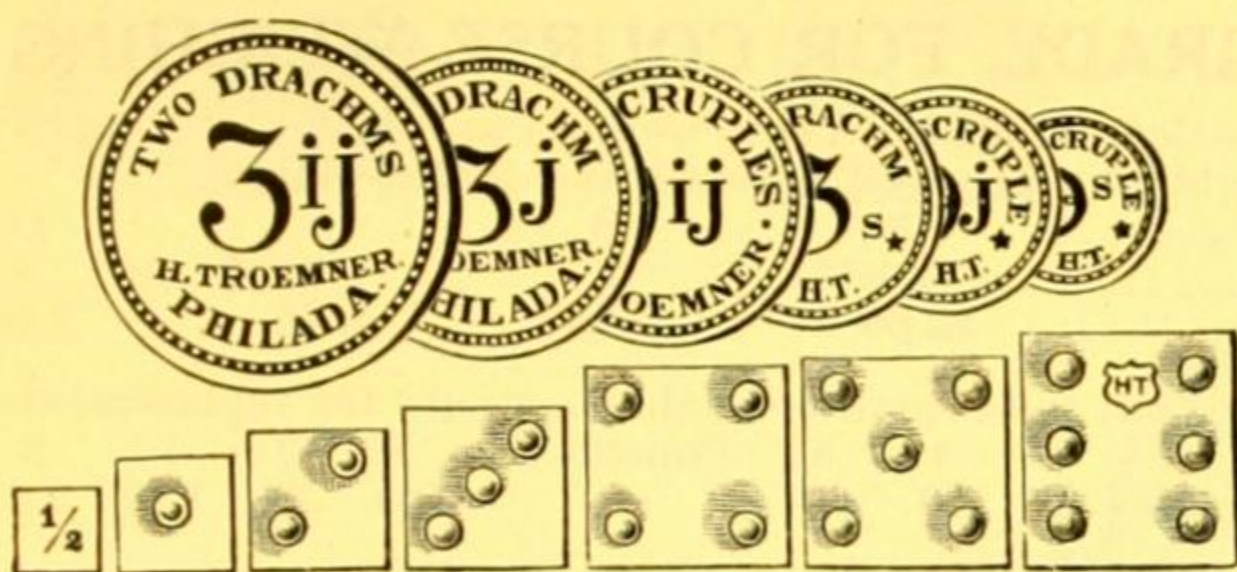
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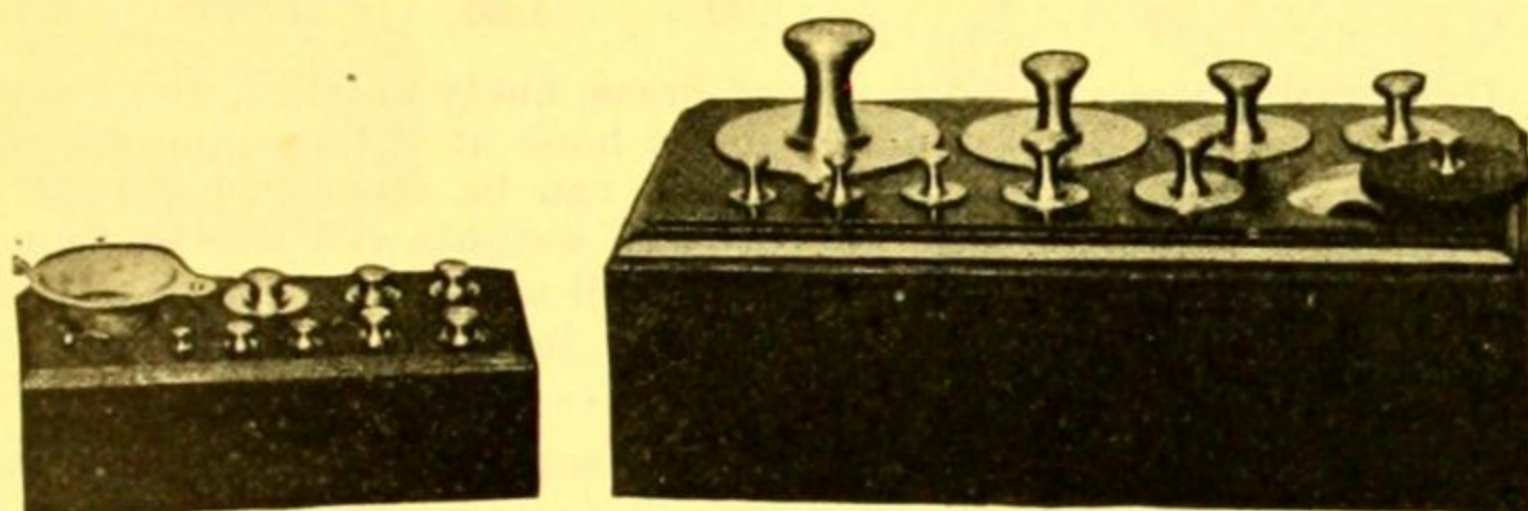
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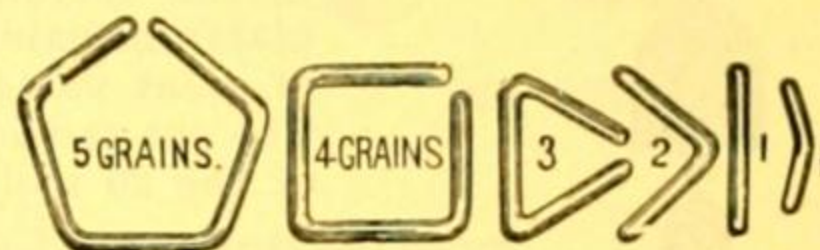
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No. 766.

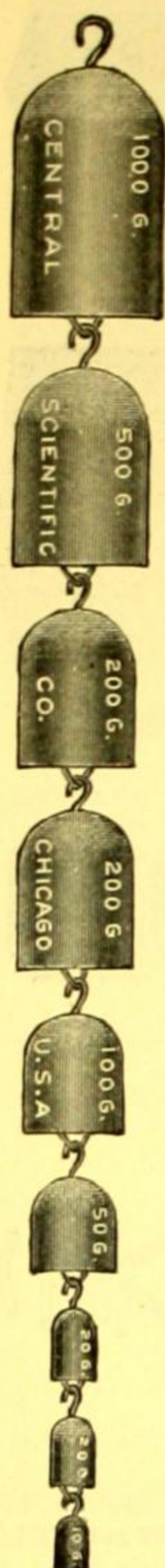


No. 764.



No. 768.

752. **WEIGHTS, Avoirdupois**, of nickel silver, from 1/128 to 1/4 ounce, consisting of one each 1/128, 1/64, 1/32, 1/16, 1/8 and 1/4 oz. **Per set** \$3.50
754. **WEIGHTS, Avoirdupois**, of brass, in hardwood block, carefully adjusted.
- | No. | A | B | C |
|------------------------|------|------|-------|
| Size, 1/8 oz. to, lbs. | 1 | 2 | 4 |
| Per set | 6.75 | 8.80 | 12.00 |
756. **WEIGHTS, Avoirdupois**, same as No. 754, single for replacements.
- | Size, ounces .. | 1/8 | 1/4 | 1/2 | 1 | 2 | 4 | 8 | Pounds | 1 | 2 | 4 |
|-----------------|-----|-----|-----|-----|-----|------|------|--------|------|------|------|
| Each | .45 | .49 | .58 | .68 | .95 | 1.15 | 1.32 | | 1.95 | 3.00 | 5.40 |
758. **WEIGHTS, Andrews Decimal Pound**, brass in block, from 0.5 to 0.001 lb. with duplicates of the 0.1, 0.01, and triplicates of the 0.001 lb. weights. Adds up to make 1 pound. Especially valuable in testing laboratories where results must be reported in English units. **per set** 14.00
760. **WEIGHTS, Prescription**, according to the United States Bureau of Standards and the New York Board of Pharmacy. In box with cover from 4 drams to 1/10 grain, consisting of the following individual weights: 4, 2, 1, 1/2 drams; 2, and 1/2 scruples; 10, 5, 2, 1, 5/10, 2/10, and 1/10 grains **per set** 4.00
762. **WEIGHTS, Prescription**, from 2 drams to 1/2 grain, the dram and scruple weights of brass, coin shaped, the grain weights of nickel. **per set** 1.10
764. **WEIGHTS, Troy**, brass, in hardwood block, adjusted to meet requirements of the Bureau of Standards, Tenth Annual Conference on Weights and Measures. Weights below 1/4 ounce furnished in pennyweights and grains unless otherwise specified.
- | No. | A | B |
|-----------------------------|------|------|
| Size 1/2 grains to, ounces. | 1 | 2 |
| Per set | 2.20 | 3.45 |
766. **WEIGHTS, Troy**, of aluminum, square, from 1/2 grain to 10 grains, in pasteboard box. Shape is such that they may be picked up readily. **per set** .90
768. **WEIGHTS, Troy**, from 1/2 grain to 5 grains in pasteboard box. Bent from aluminum wire, in shapes convenient to handle. **per set** .80



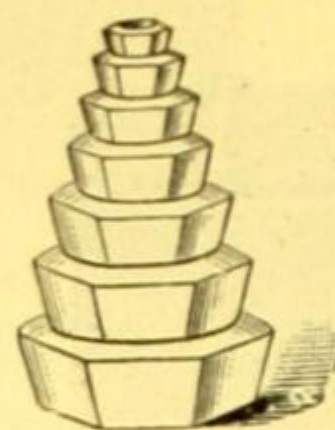
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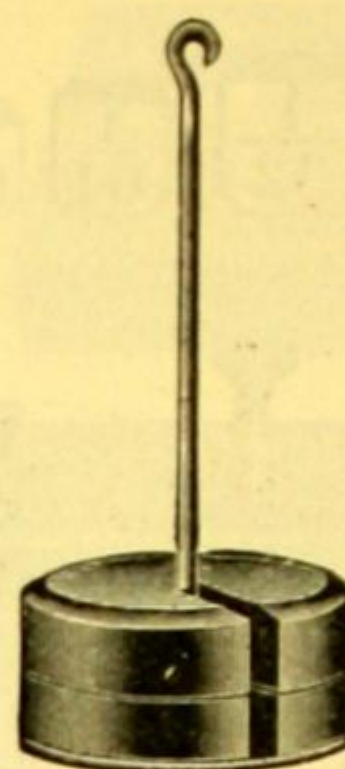
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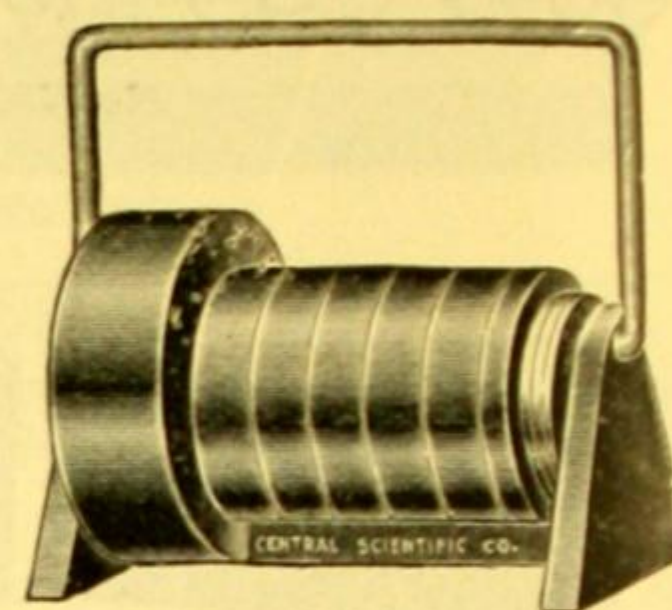
No. 774.



No. 788.



Nos. 800-802.



No. 792.

WEIGHTS, ORDINARY GRADE, FOR COURSE WEIGHING

770. **WEIGHTS, Avoirdupois, Iron, sealed, in nests.** These weights are the highest quality produced in this style of weight and are well finished and nickel-plated.

No.	A	B	C	D
Size $\frac{1}{4}$ oz. to, lbs.	1	2	4	8
Per set	\$2.60	3.40	4.75	7.00

772. **WEIGHTS, Avoirdupois, Iron, sealed, same quality as above, single for replacements.**

Size, ounces	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8	Pounds	1	2	4	8
Each	.35	.35	.35	.40	.40	.50		.55	.85	1.40	2.50

774. **WEIGHTS, Avoirdupois, of iron with ring handle.**

Size, pounds	1	2	5	10
Each	.90	1.20	1.50	2.75

778A. **WEIGHTS, Metric, Universal.** These weights are of brass, finely finished, and are of a high degree of accuracy. They are provided with a hook at the top and an eye in the bottom, which is concave so that the weights can be stood upright on a platform balance. This is a distinctly high grade set of weights and will be found of great value in physical laboratory experiments, as well as for general weighing. The set consists of nine weights ranging from 10 grams to 1 kilo, with duplicates of the 20 and 200 gram pieces.

778B. **BLOCK, of hardwood, with holes to take No. 778A set of weights.** 1.40

780. **WEIGHTS, separate, same as No. 778.**

Size, grams	10	20	50	100	200	500	1000
Each	.30	.35	.60	.65	.70	.90	1.25

788. **WEIGHTS, Metric, Iron, in nests, carefully adjusted.** Sets have duplicates of 20, 200 and 2000 grams. The 10 kilo weight supplied with handle.

No.	A	B	C
Size 5 grams to, kilos.	1	2	5
Per set	2.70	4.30	9.00

790. **WEIGHTS, Metric, Iron, Single, same as No. 788, for replacements.**

Size, grams	5	10	20	50	100	200	500	Kilos.	1	2	5
Each	.12	.12	.13	.20	.22	.27	.45		.70	1.60	3.20

792. **WEIGHTS, Metric, Iron, Slotted, with holder.** Set consists of one 500, five 100, one 50, two 20 and one 10 gram weights. These weights will fit No. 798 Weight Hanger listed below.

Per set 4.00

794. **WEIGHTS, Metric, Iron, Single.** Same as in No. 792. Specially valuable in connection with No. 798 Hanger for use in Physics experiments with simple machines, forces, etc.

Size, grams	10	20	50	100	500
Each	.18	.20	.40	.45	.65

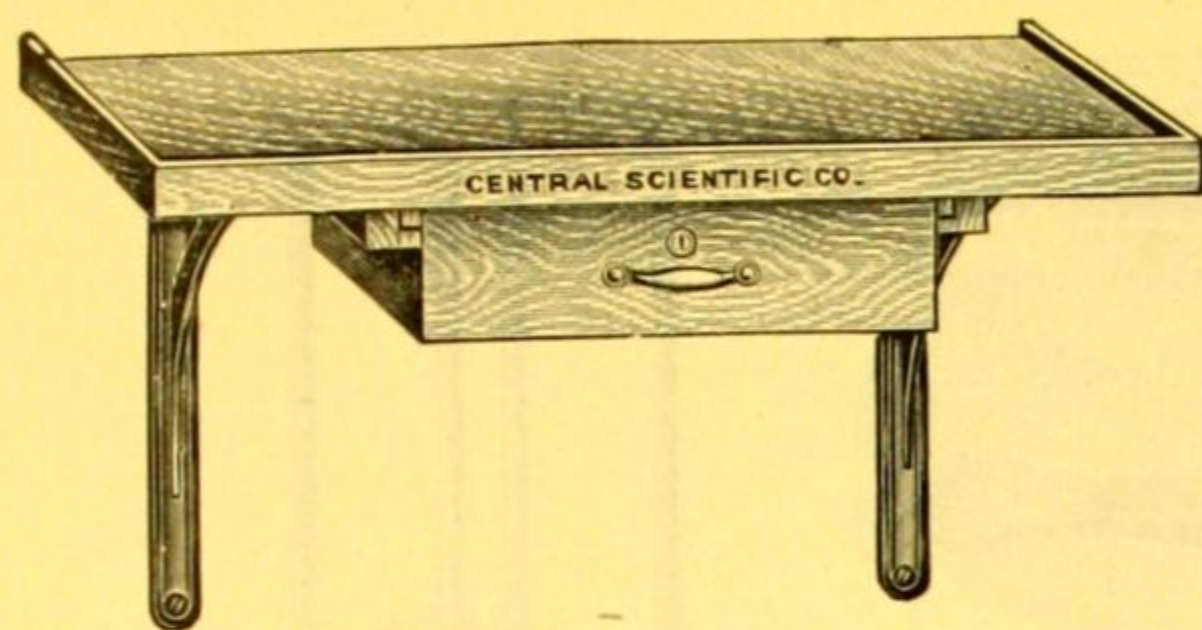
796. **WEIGHT HOLDER, only, of No. 792.** Useful for holding No. 794 weights. .35

798. **WEIGHT HANGER, for No. 794, weight 50 grams, capacity, 1500 grams.** .40

800. **WEIGHTS, Metric, Iron, Slotted, for use with hanger No. 802 in experiments with Sonometers, Young's Modulus, Hooke's Law, Torsion, etc.**

Size, kilos	$\frac{1}{2}$	1	2	5
Each	.45	.60	1.00	2.40

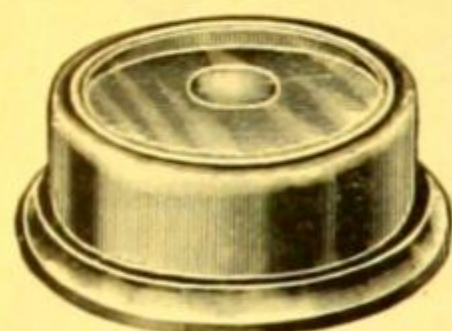
802. **WEIGHT HANGER, for use with No. 800 Weights, of iron with hook; weight, 1 kilo; capacity, 20 kilos** .90



No. 810.



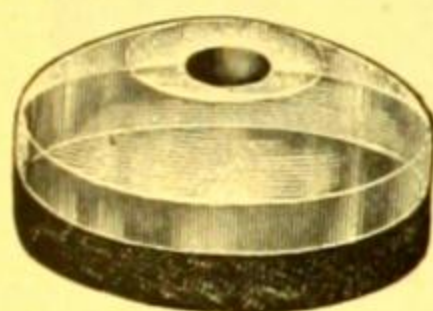
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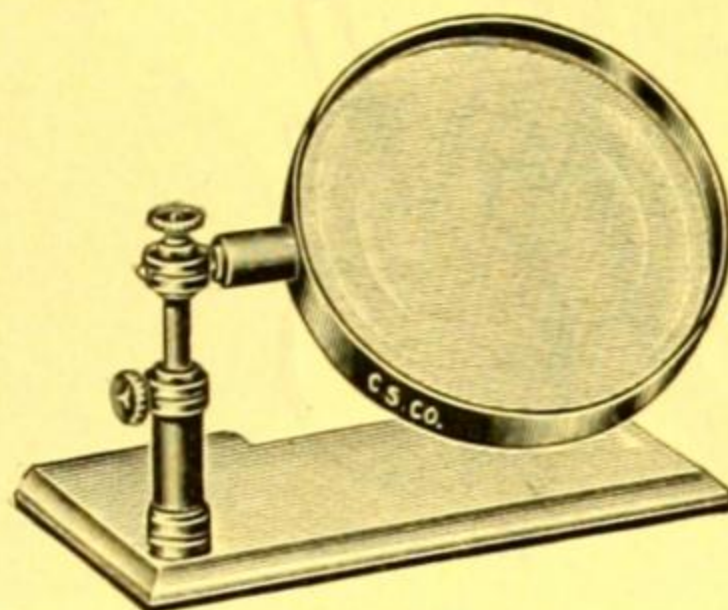
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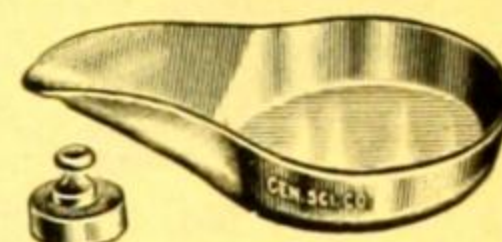
No. 814.



No. 822.



No. 820.



No. 826.

BALANCE ACCESSORIES

810. **BALANCE BRACKET** or support, with drawer and key, for attachment to wall where it will be out of the way and less exposed to vibrations. Size of top surface, 60 x 35 cm, with raised edge. \$11.00
812. **BALANCE COVER**, of good quality rubber cloth. A very convenient protection to balances. Made to order to fit any balance. When ordering, please give extreme outside dimensions of balance case 3.00
814. **BALANCE DESICCATOR**, triangular in shape to fit in corner of balance case. Of glass, 2 inches on a side, 1½ inches high..... .80
816. **BALANCE LEVEL**, circular brass frame, spirit filled; diameter 25 mm..... 6.00
820. **BALANCE READING GLASS** or magnifier, to place before indicating scale to facilitate rapid readings; on adjustable support..... 7.00
822. **BALANCE RESTS**, glass, to place under the leveling screws of balances.....each .18
824. **BALANCE WATCH GLASSES**, counterpoised, accurately adjusted for analytical work.
- | | | |
|-------------------|-----|-----|
| Diameter, mm..... | 62 | 75 |
| Per pair | .60 | .60 |
826. **BALANCE WEIGHING SCOOPS**, of aluminum, with lip and counterpoise. Accurately adjusted. Size B holds about 12 gms of wheat flour, size C about 50 gms.
- | | | | |
|-------------------------|------|------|------|
| No. | A | B | C |
| Capacity about, cc..... | 10 | 30 | 125 |
| Each | 1.50 | 1.80 | 2.00 |

BALANCES

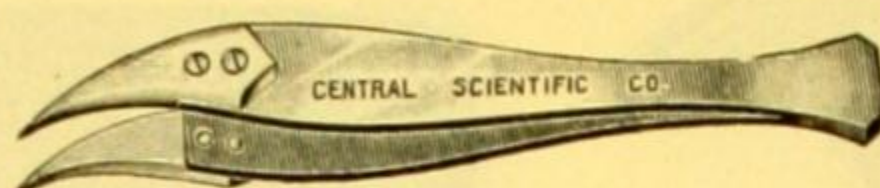
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A



No. 828A.



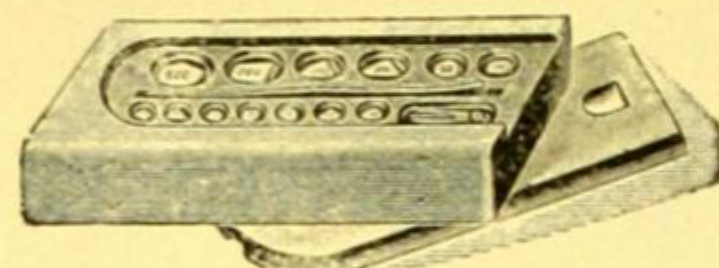
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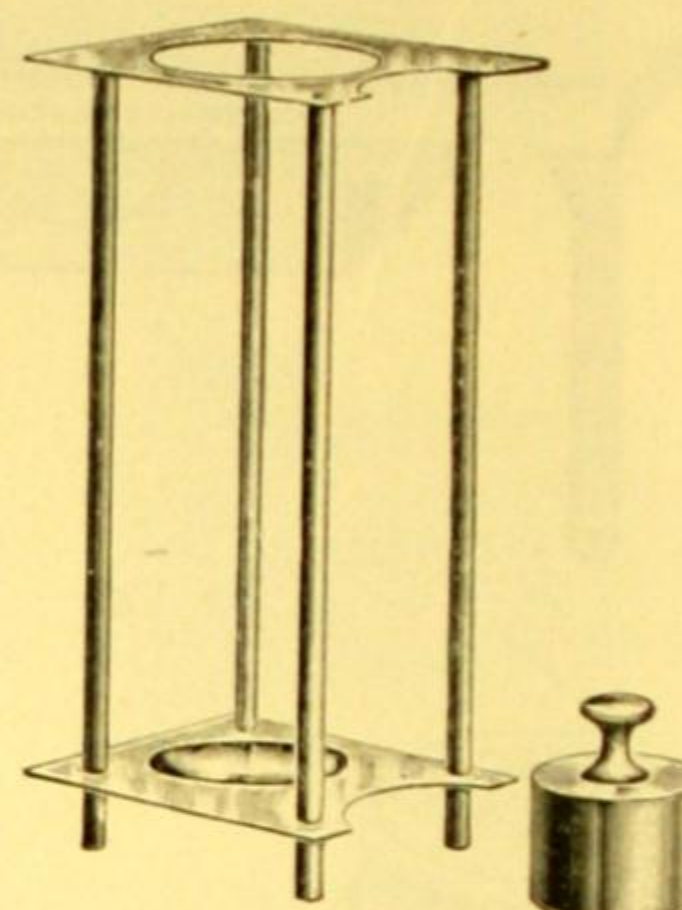
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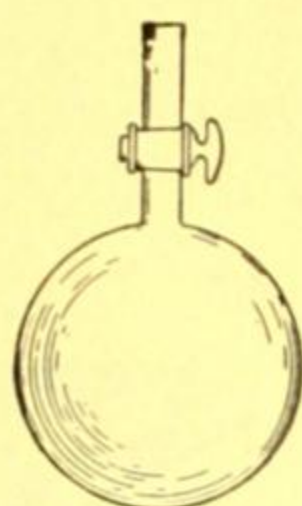
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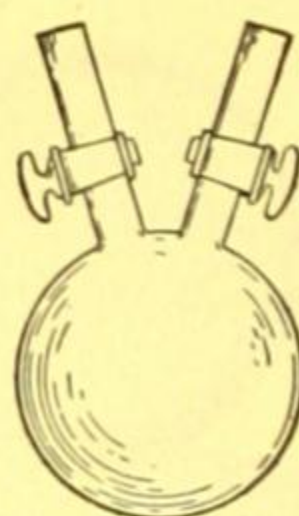
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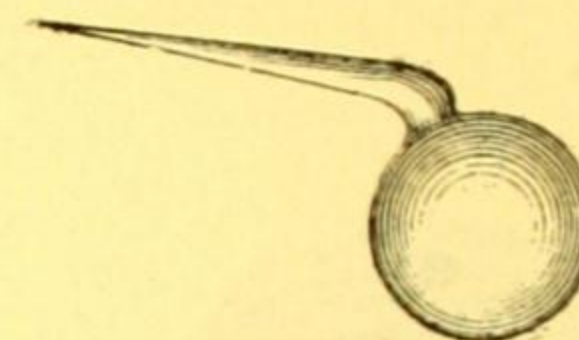
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No. 854B.



No. 854D.

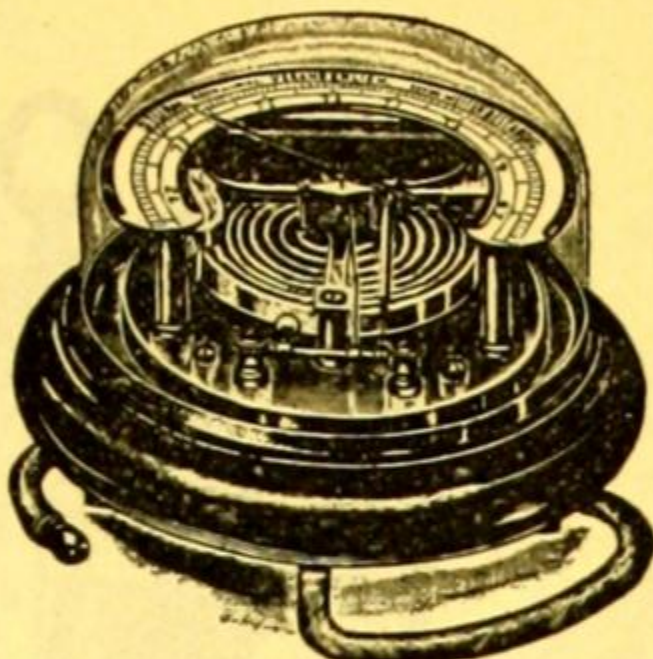


No. 856.

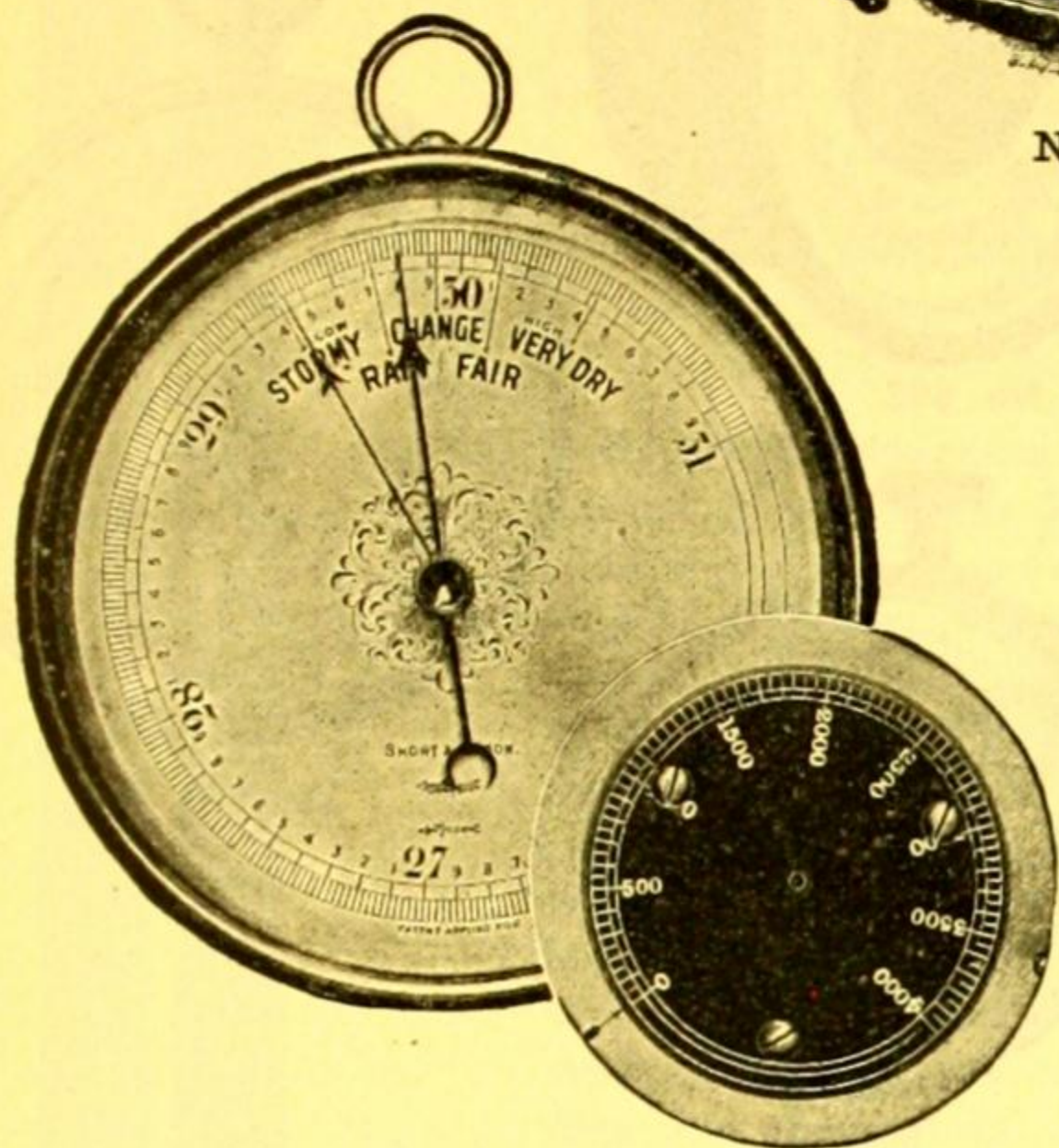
- 828A. **BALANCE WEIGHING SCOOP**, of glass, flat bottom with spout. Length, 67 mm..... \$0.70
830. **BALANCE WEIGHING SCOOP**, of German silver, with long spout and counterpoise, as used in sugar analysis. Diameter of scoop, 80 mm; length, including spout, 120 mm; depth, 40 mm. Highly polished with brass counterpoise. (See Browne's Handbook of Sugar Analysis, page 203.) 6.00
836. **BALANCE WEIGHING TUBE SUPPORT**, nickel-plated, for horizontal or vertical use... 3.00
838. **FORCEPS**, for use with set of weights; brass with curved points; ivory tipped, heavily lacquered. Length over all, 95 mm..... 1.00
840. **FORCEPS**, of brass with curved tips. Length, 95 mm..... .25
842. **WEIGHT BLOCK**, of polished wood, with sliding cover, empty, with separate compartments for holding fractional weights Nos. 712 and 748. Convenient for placing in balance case... 1.00

BALLOONS

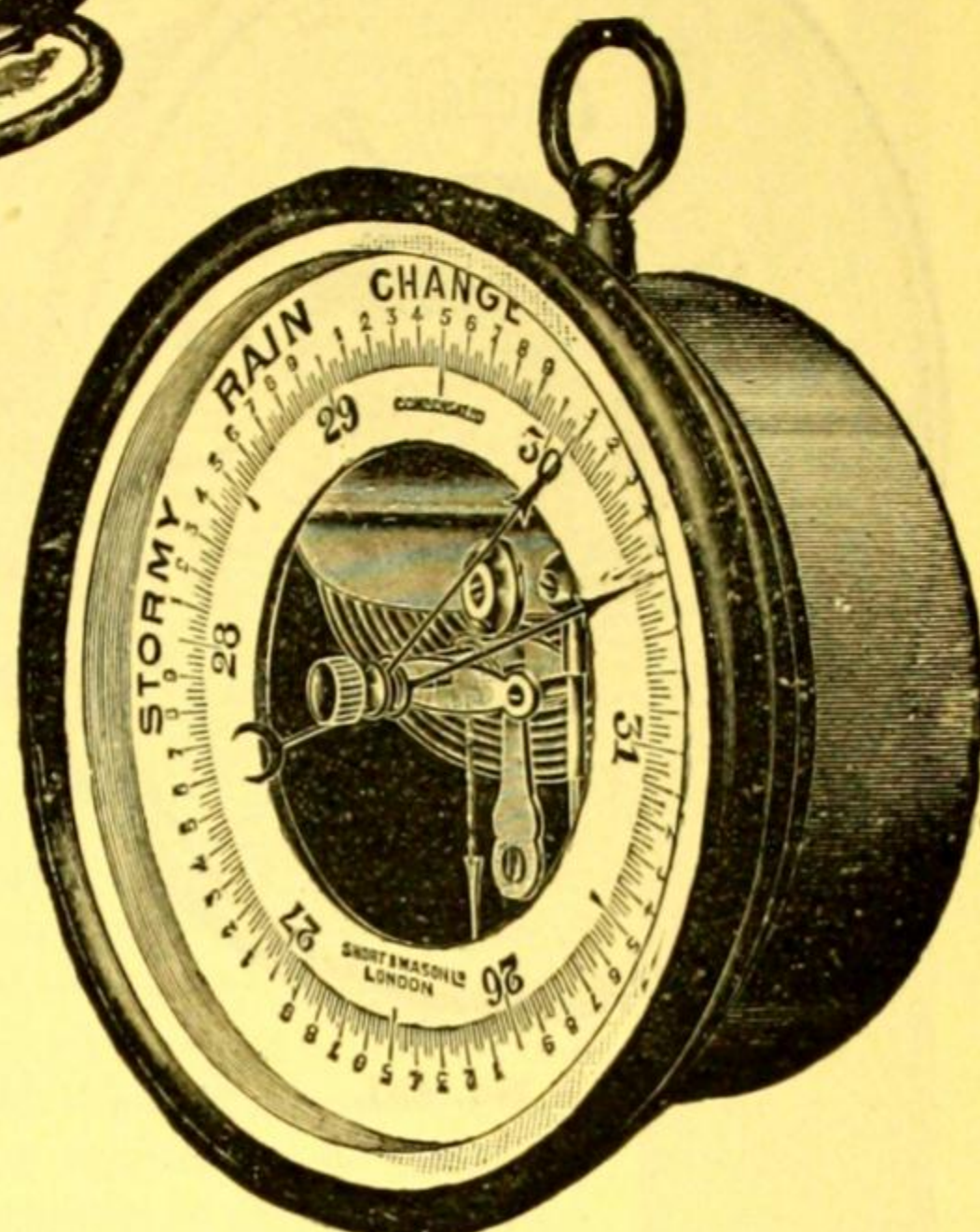
854. **BALLOONS**, Glass, very thin for weighing gases. Capacity, about 250 cc.
- | | | |
|-------------|------|------|
| Style | B | D |
| Each | 2.00 | 2.80 |
856. **BALLOON**, Glass, Dumas Type, for determining the specific gravity of vapors. Of very thin blown glass. Capacity, about 200 cc..... .30
858. **BALLOON**, Rubber, pure gum, diameter about 5 cm..... each .05
per dozen .50



No. 872.



No. 876.



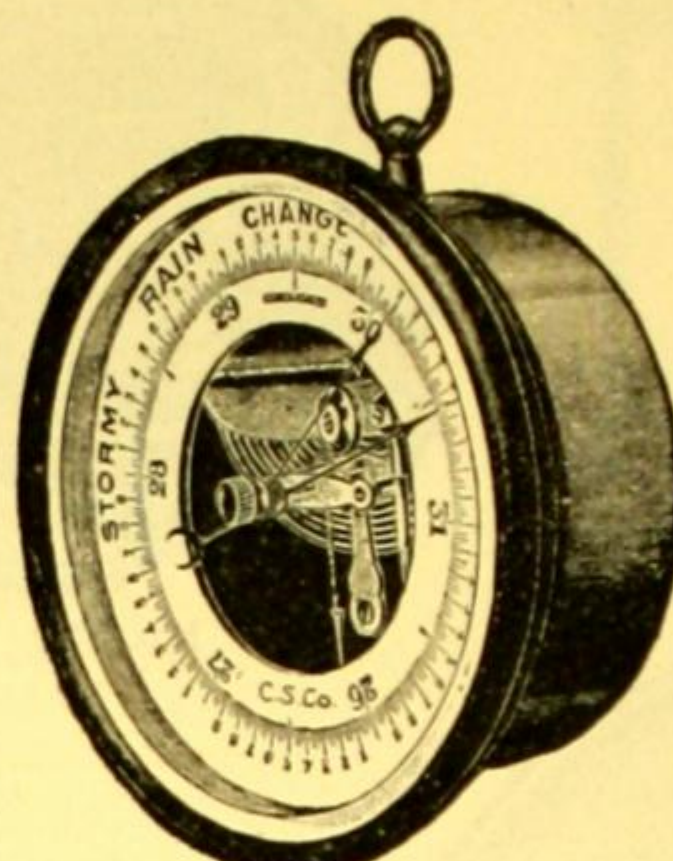
No. 880.

BAROMETERS

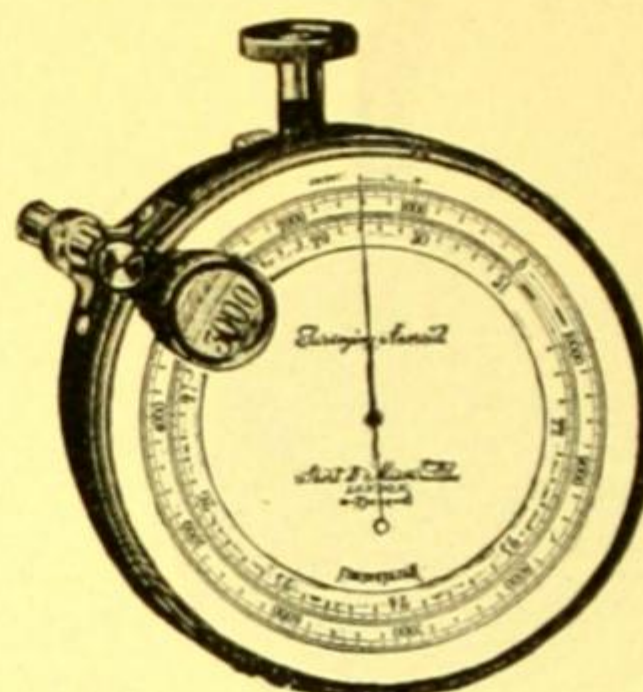
872. **BAROMETER, Aneroid, Demonstration Form, English and Metric Scales**, a very useful instrument which should be in every laboratory in which the principle of the barometer is taught. By simply blowing in or drawing out the air by means of a rubber tube the effect of the atmospheric pressure upon a barometer is clearly demonstrated. This barometer is handsomely mounted and finished and makes a very accurate instrument for daily barometric observations. Graduated from 28 to 31 inches by 0.05 inch divisions and 715 to 800 mm by 1 mm divisions \$15.00
876. **BAROMETER, Aneroid, English and Metric Scales**, with weather marks arranged for sea level readings. This instrument is provided with an adjustment which renders it suitable for use in any location from sea level to 3,500 feet elevation. The adjustment is very simple and no derangement of the working parts is necessary. Once adjusted for a given location by the observer, no further adjustment is required. A list showing altitudes of Meteorological Stations in the United States is furnished with each barometer, and also a simple weather forecast card. To adjust the barometer for altitude for a given city, town or location, turn the brass plate set in the back of the case (this is easily done with the fingers) until the number of feet corresponding to the elevation of the city or town is opposite the arrow. The hand will then point to the proper weather mark and the reading will be the same as that of the U. S. Weather Bureau, which is Sea Level Reading. Spun brass case, 5 inches in diameter; enameled dial; adjustable stationary hand for marking the last position of the movable hand. Range, 26 to 31 inches by 0.02 and 650 to 790 mm by 1 mm 15.00
877. **BAROMETER, Aneroid.** Same as No. 876, but with dial graduated from 22 to 29 inches, for use in altitudes between 3,500 and 7,000 feet. With English and metric scales..... 18.00
880. **BAROMETER, Aneroid, English and Metric Scales**, as adopted by the United States Navy. An accurate instrument with practically all parts constructed of non-corrosive metals such as nickel-silver or phosphor bronze. The dial is of silvered metal with open center. It is divided with great accuracy in both inches and millimeters from 26 to 31 inches by 0.02 inches and from 650 to 790 millimeters by 1 millimeter divisions. The movement is extra-grade, compensated for temperature changes, thus insuring accurate readings of barometric pressure at all times. The case is of lacquered brass and is five inches in diameter. For altitudes up to 3,500 feet. 20.00



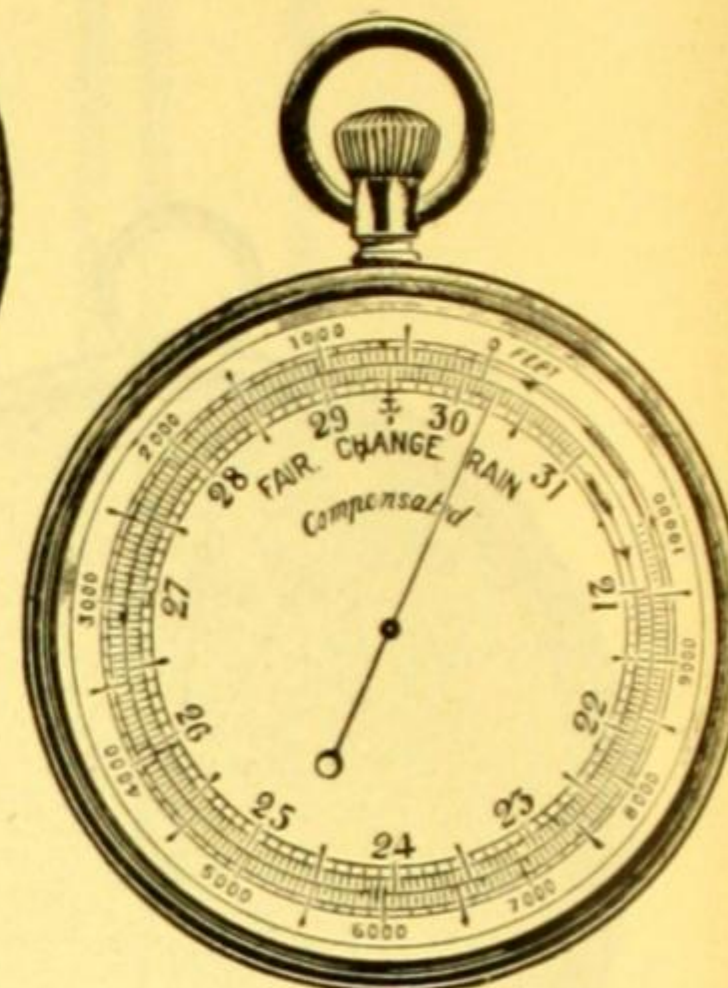
No. 881.



No. 882.



No. 886.



No. 884.

881. **BAROMETER, Aneroid, English and Metric Scales.** Brass case, 5 inches in diameter; open enameled dial; visible works. Graduated from 26 to 31 inches in divisions of 0.02 inch, and from 650 to 790 mm by 1 mm. For use in altitudes up to 3,500 feet..... \$10.00

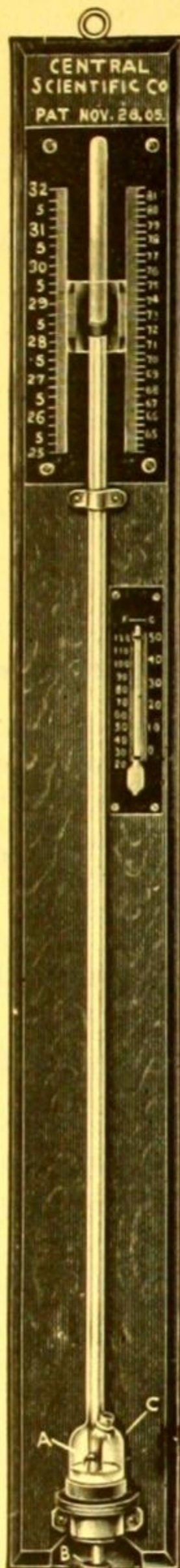
881A. **BAROMETER, Aneroid,** similar to No. 881, but with dial graduated from 23 to 29 inches, for use in altitudes between 2,900 and 7,100 feet. With English scale only..... 16.50

882. **BAROMETER, Aneroid,** 4 inch card dial, open face, nickel-plated case. Graduations in both English and metric systems. For altitudes up to 3,000 feet. Without altitude scale. Range, 27 to 31 inches by 0.05 and 690 to 790 mm by 1 mm. 5.00

884. **BAROMETER, Aneroid,** pocket mountain type, watch case form, 1 3/4 inches in diameter, highest quality, compensated for temperature, silvered metal dial, revolving altitude scale, in gilt case. Enclosed in neat morocco case.

No.	A	C
For altitudes up to, feet.....	3,000	16,000
Size of divisions, feet.....	10	100
Each	30.00	32.00

886. **BAROMETER, Aneroid, Surveying,** especially designed and constructed for the purpose of readily ascertaining slight variations in gradients, levels, etc. Besides extreme sensitiveness, the specialty claimed for this instrument is an arrangement of the scale of altitudes which admits of subdivisions by a vernier. Compensated for temperature changes and reads to two feet of altitude scale. 3 inch bronze metal case, silvered metal dial, with vernier scale moved by rack-work motion, reading lens arranged to traverse the entire circle, altitude scale 6,000 feet, in solid leather sling case. Weight, 38 ounces 80.00



No. 890.

890. **BAROMETER, Mercurial, Cenco, Fortin Principle.** Has straight glass tube of heavy wall and uniform bore and is provided with a screw adjustment for changing the level of the mercury in the cistern. The scales are readable by means of a vernier to 0.1 mm and 0.005 inch. The lowest possible reading is 25 inches (63.5 cm), so that the barometer is not satisfactory for altitudes above 4,000 feet. (See No. 891 for a high altitude barometer.) Complete with thermometer having both a Centigrade and a Fahrenheit scale..... \$30.00

891. **BAROMETER, Mercurial, Cenco.** Same as No. 890, but with a scale reading down to 20 inches (50.8 cm). For use in altitudes up to 10,000 feet..... 35.00

894. **BAROMETER, Standard Mercurial, United States Weather Bureau Type, Fortin Principle.** This barometer is of the highest type of excellence, indorsed by the United States Weather Bureau and fully warranted by the manufacturer. The mercury tube is inclosed in a brass body with gun-metal finish, having at its upper end two vertical openings, in which the vernier works, the latter operated by a rack and pinion movement. The readings are taken through these openings, aided by light reflected from a white opaque glass reflector attached to the board behind. The scale is graduated on one side in inches and 10ths, and on the other in centimeters and millimeters, the vernier enabling a reading to be taken, in each case respectively, of one-thousandth of an inch and one-tenth of a millimeter. The attached thermometer consists of a well seasoned tube with both Centigrade and Fahrenheit scales, with the figures etched on the stem. It is so mounted that it can easily be removed for testing, etc. Reads down to 25½ inches (64.8 cm) and is therefore not satisfactory for altitudes above 3,500 feet.

Complete with board back of finely finished hardwood, to which is attached a brass bracket to receive the ring in the top of the barometer, a ring with steadying screws to clamp about the cistern, and white opaque glass reflectors forming a translucent background for reading the instrument..... 71.00

895. **BAROMETER, Standard Mercurial, United States Weather Bureau Type.** Same as No. 894, but without the board back..... 60.00

896. **BACK** only of No. 894 Standard Barometer..... 11.00

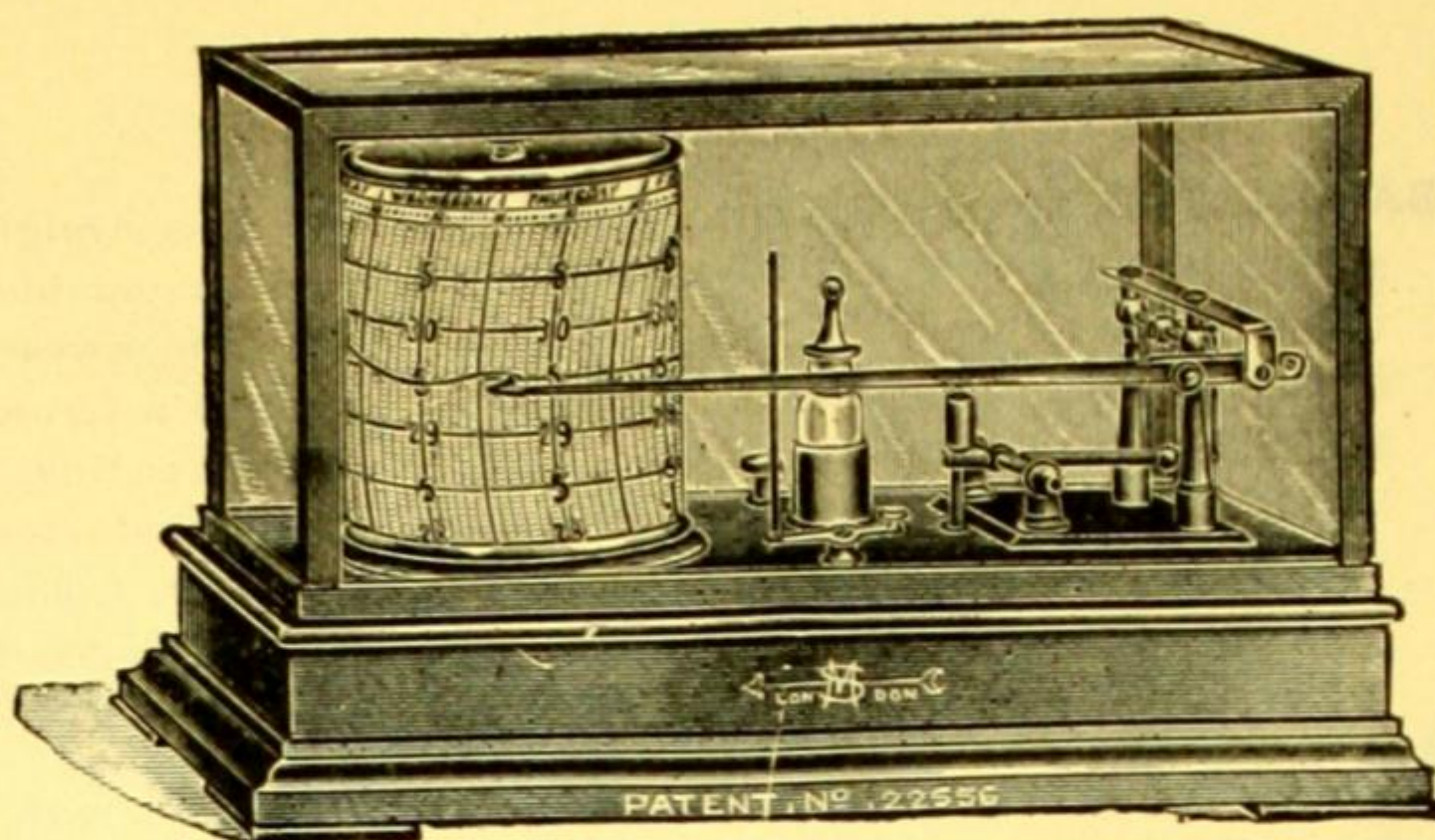
898. **BAROMETER, Standard Mercurial, United States Weather Bureau Type.** Same as No. 894, but with a scale reading down to 20 inches (50.8 cm) for use in altitudes up to 10,000 feet..... 92.50

899. **BAROMETER, Standard Mercurial, United States Weather Bureau Type.** Same as No. 898, but without board back..... 80.00

900. **BACK** only of No. 898 Standard Barometer, described under No. 894.. 12.50

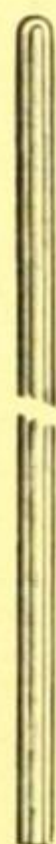


No. 894.

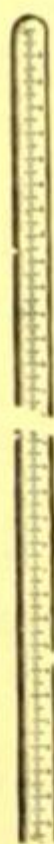


No. 908.

908. **BAROMETER, Recording (Barograph)**, in mahogany case, with glass top and sides, and storage space for charts.
This instrument enables one to keep a continuous record of changes in the pressure of the atmosphere by means of which the approach of a "low" or "high" may be predicted from the record on a single chart, covering a period of one week. For statistical purposes the charts may be readily filed and indexed chronologically for quick reference. Complete with charts for a year, pen and ink..... \$50.00
909. **BAROGRAPH CHARTS**, for No. 908 Barograph. In boxes containing one year's supply. per box 3.00
- Note:**—In ordering Barograph charts, to insure fit it is necessary to send in a sample of the kind in use.
920. **INK**, purple, for Barographs and Thermographs per bottle .55



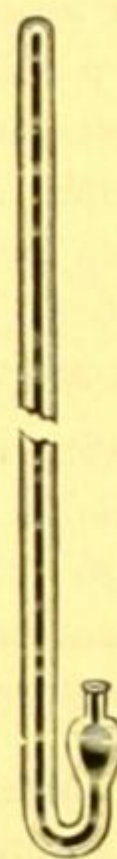
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No. 926.



No. 928.



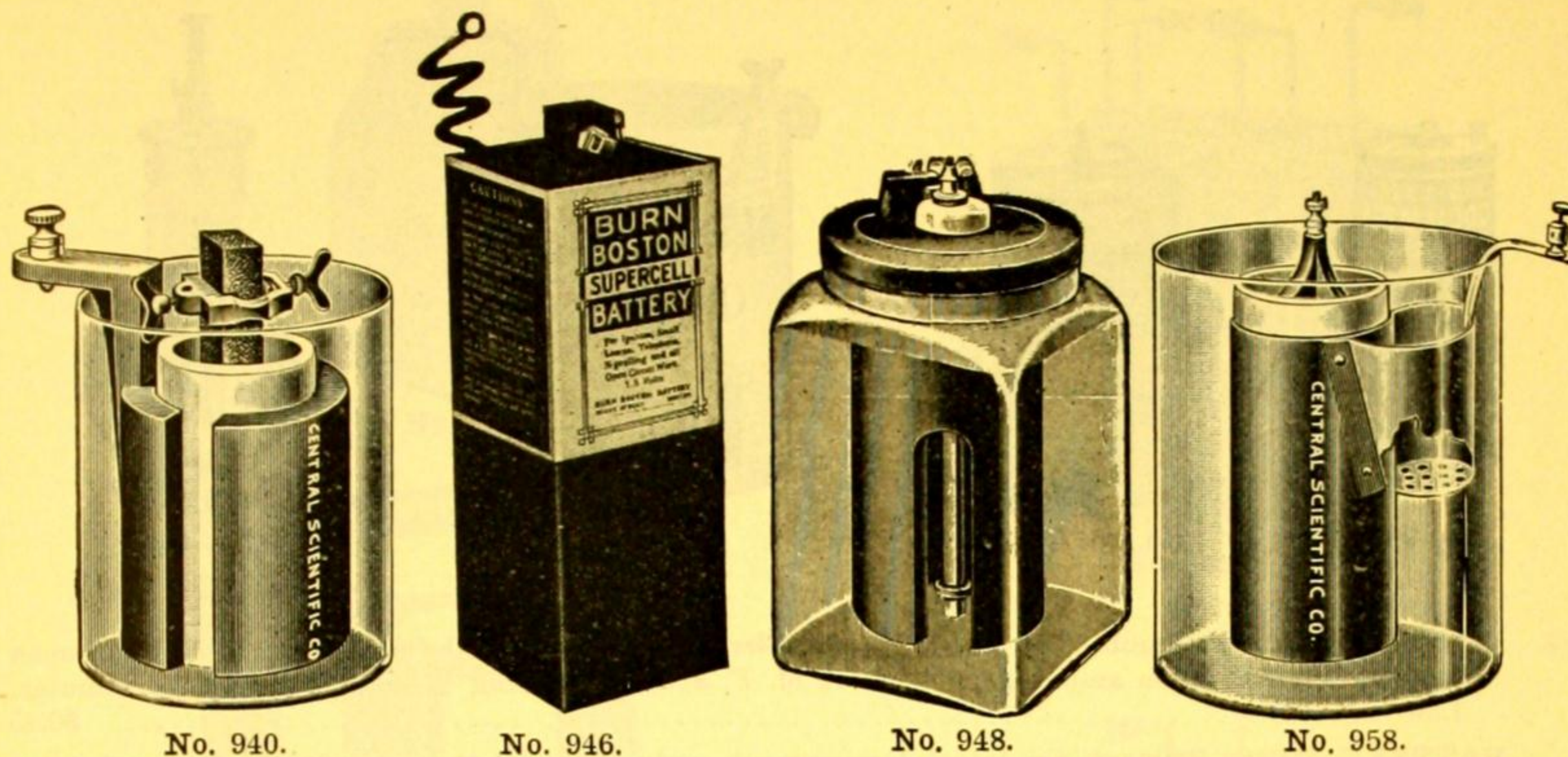
No. 932.



No. 934.

922. **BAROMETER TUBE**, unfilled, large bore, thick wall, one end sealed. Length, 80 cm.... .50
924. **BAROMETER TUBE**, unfilled, same as No. 922, with glass mercury well and pipette for filling70
926. **BAROMETER TUBE**, unfilled, same as No. 922, but graduated in millimeters..... 2.00
928. **BAROMETER TUBE, Demonstration Form**, unfilled, with funnel top and with stopcock at top and bottom for easy filling and emptying of the tube. Total length, 104 cm. Graduated from 100 to 780 mm in millimeter divisions..... 6.00
930. **MERCURY WELL**, japanned iron. Capacity about 50 cc..... .55
932. **BAROMETER TUBE, Siphon Type**, unfilled, with bulb on short arm. Length, 80 cm.... .60
934. **BAROMETER TUBE, Siphon Type, Bunsen's**, unfilled. Graduated at the top of each arm in millimeter divisions 4.00

BASAL METABOLISM APPARATUS, see page 533.



No. 940.

No. 946.

No. 948.

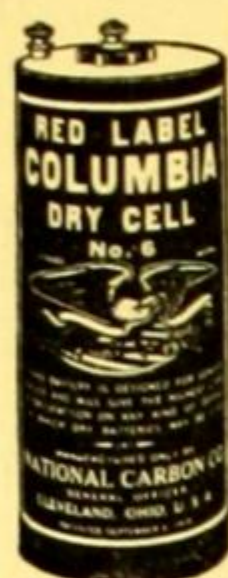
No. 958.

BATTERIES, PRIMARY

940. **BATTERY, Bunsen**, for open circuit work. A powerful two-fluid cell of about 1.9 volts E. M. F. and 1.86 ohms internal resistance. An excellent cell for operating induction coils, motors, etc., and for electrolysis of water. Quart size, complete without chemicals..... \$2.30
941. **CARBON** for No. 940..... .12
942. **ZINC CYLINDER** with binding post for No. 940 1.25
1084. **CLAMP** for No. 941 Carbon, with binding post for wire..... .30
944. **POROUS CUP**, 2x4 inches, for No. 940..... .30
- 8040A. **GLASS JAR**, 4x5 inches, for No. 940..... .35
946. **BATTERY, Burn-Boston Addwater**. A battery containing an exact balance of active elements, zinc, carbon, and salt solution. In dry cells destruction of the elements goes on continuously, whether used or not. In the Burn-Boston this process is arrested while the current is not being used. The zinc shell, being insulated from the electrolyte, cannot be acted upon by it. Except for a pin hole vent the cell is tightly sealed. All sources of leakage are thus done away with.

Distinctive Features.

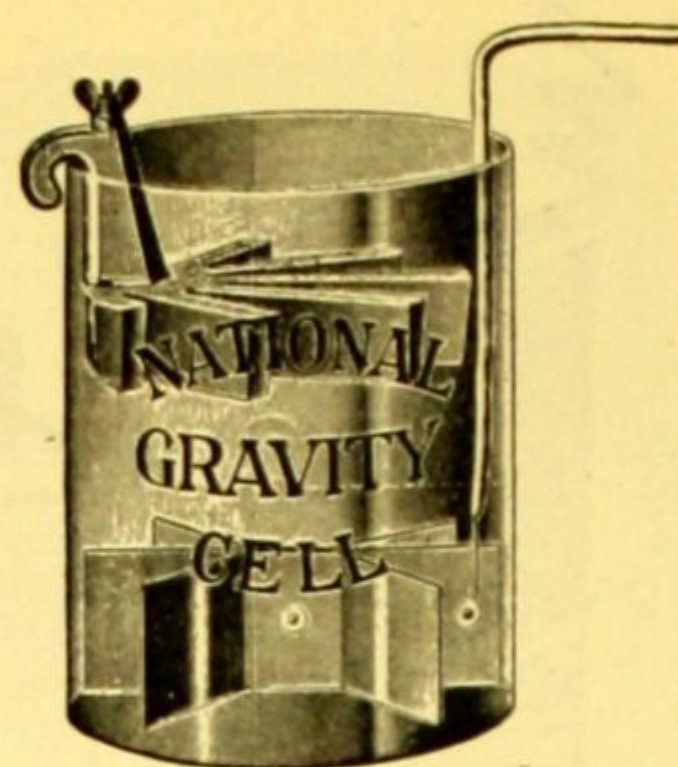
- (1) Yields from three to twelve times the service of dry cells.
 - (2) Will never leak or burst.
 - (3) Can be stored, fully charged, for any length of time and in any climate.
 - (4) Will yield all of its phenomenal electrical content whether the period of use is three months or three years.
- Size, $7\frac{1}{2} \times 2\frac{1}{16} \times 2\frac{1}{16}$ inches; voltage, 1.5 volts; amperage, 20 amperes..... 1.90
948. **BATTERY, Carbon Cylinder**, for open circuit work. Well adapted for all telephone and bell service. Initial output, 1.4 volts, 6 amperes. Cell complete with chemicals..... 1.40
949. **CARBON** for No. 948..... .90
950. **ZINC ROD** with binding screw for No. 948..... .08
951. **GLASS JAR** for No. 948..... .30
954. **BATTERY, Daniell**, quart size. Consists of No. F3397 Copper, No. F3398 Zinc, No. 944 Porous Cup and No. 8040A Jar. An excellent battery for demonstration use with constant E. M. F. of about 1.08 volts. Complete without chemicals95
958. **BATTERY, Daniell**, gallon size. This has been the standard cell for many years for open or closed circuit work. The best for all laboratory work in electrical measurements. Next to the standard cells, it gives the most constant E. M. F., about 1.08 volts, which remains the same during the life of the cell. Internal resistance from 2 to 5 ohms. With new form riveted copper pocket for holding copper sulphate crystals. Complete without chemicals..... 2.75
959. **COPPER, New Form**, with riveted copper pocket, for No. 958..... 1.00
960. **ZINC**, weight about two pounds, with binding screw attached, for No. 958..... .50
961. **POROUS CUP**, 3x7 inches, for No. 958..... .60
- 8040C. **GLASS JAR**, 6x8 inches, for No. 958..... .65



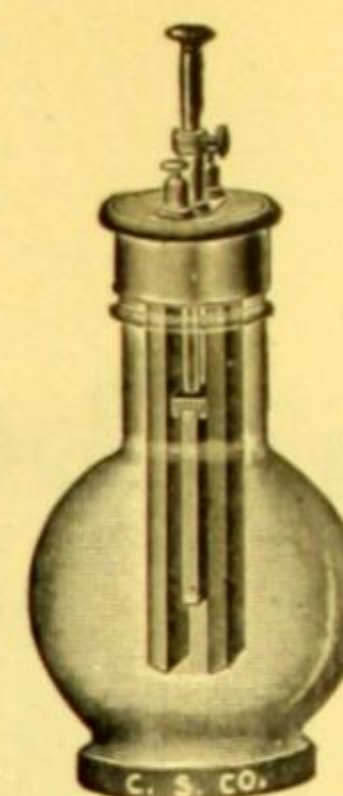
No. 964.



No. 966A-B.



No. 976.



No. 980.

964. **BATTERY, Dry, Columbia, Red Label No. 6.** The best dry cell on the market. E. M. F. on open circuit, 1.5; maximum amperage, 4 to 6; E. M. F. after delivering $\frac{1}{2}$ ampere for thirty minutes, 1.36 \$0.45

BATTERY, Edison Primary, the latest development, embodying all the good features of and many improvements in the class of cells formerly known as the Edison Lalande and later as the Edison Bisco Battery. The elements are the same as in the earlier types but the efficiency and effective capacity have been greatly increased by a better proportioning of active materials and by an improved method of suspension. These cells are the best type of wet cell for continuous service because of their very low internal resistance and ease of renewal of exhausted parts. The new type of cell is contained in glass jars made of the new heat resisting glass, which possesses also greater mechanical strength than the porcelain jars formerly supplied. In selecting cells for laboratory use, it is important to select a sufficient number to secure the necessary voltage and to select those of size and capacity great enough to deliver current at the proper rate, as the larger sizes have very low internal resistance and long life and consequently operate at lowest maintenance cost. Initial E. M. F., 0.95 volts, decreasing to about 0.65 on average load.

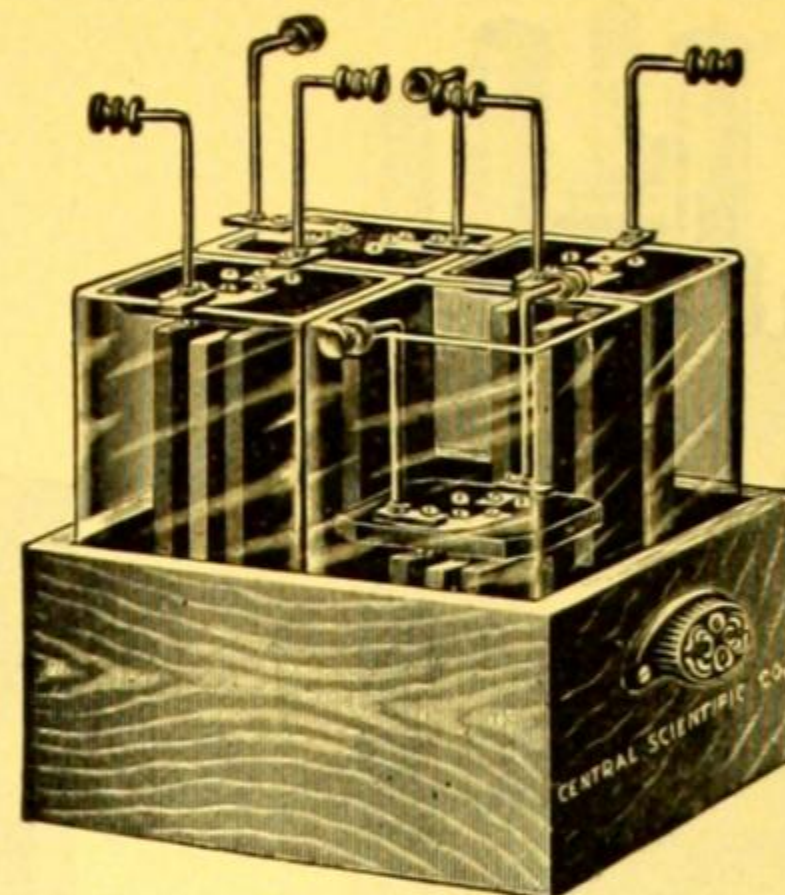
Distinctive Features.

- (1) E. M. F. constant through life of cells.
- (2) Simplicity and ease of renewal.
- (3) Visible indication of approaching exhaustion.
- (4) Uniformity of units.
- (5) Long life and service.
- (6) Entire absence of local action.
- (7) Low maintenance cost.

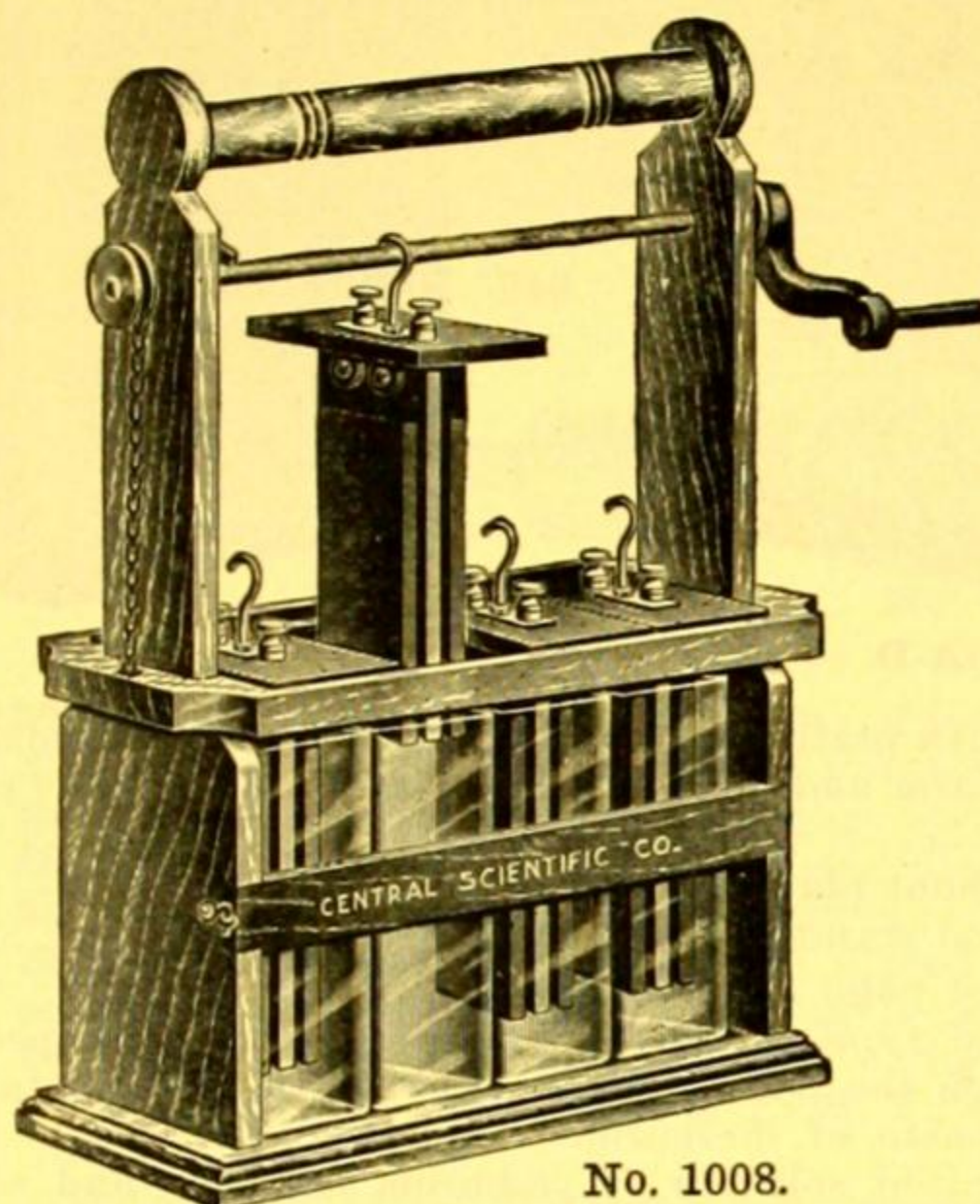
	Number	A	C
	Type	202	402
	Size over all, inches.....	$3\frac{3}{8} \times 6 \times 11$	$5\frac{3}{8} \times 6\frac{3}{8} \times 12\frac{1}{4}$
	Average internal resistance, ohms.....	0.05	0.04
	Capacity, ampere hours.....	200	400
966.	COMPLETE CELL	3.30	5.00
967.	COMPLETE RENEWAL	1.90	2.50
976.	BATTERY, Gravity, Crowfoot Type , especially adapted for closed circuit work. Standard type for telegraph companies. E. M. F. about 1.1 volts; internal resistance from 1 to 5 ohms. Gallon size, complete without chemicals.....		1.30
977.	COPPER for No. 976.....		.15
978.	CROWFOOT ZINC , with connector, for No. 976		.50
8040C.	GLASS JAR , 6x8 inches, for No. 976.....		.65
980.	BATTERY, Grenet, French Type , pint size. Most convenient form for use on lecture table, giving very powerful current for a short time. The E. M. F. is 2 volts at the start. Small internal resistance. Height of cell 8 inches. Complete without chemicals.....		3.80
981.	CARBONS for No. 980.....		each .12
982.	ZINC for No. 980.....		.40
983.	GLASS JAR for No. 980, complete with brass ring		1.20



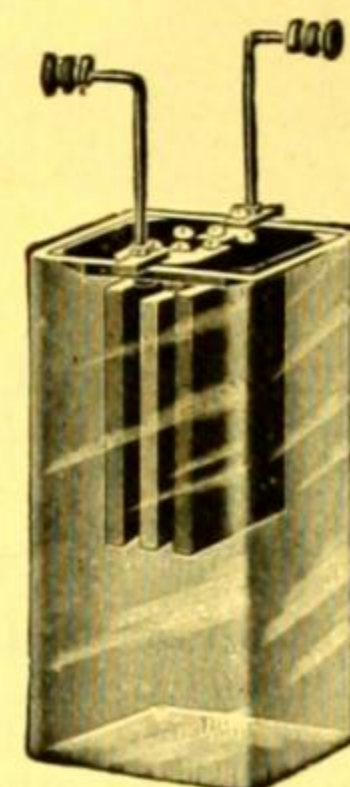
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No. 1002.

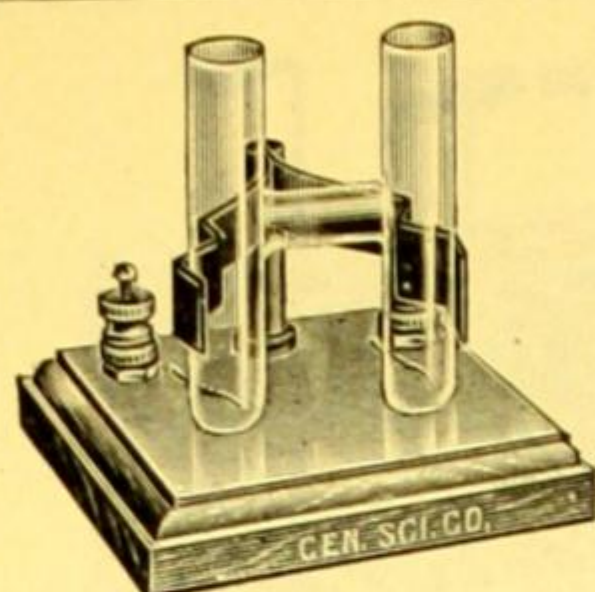


No. 1008.

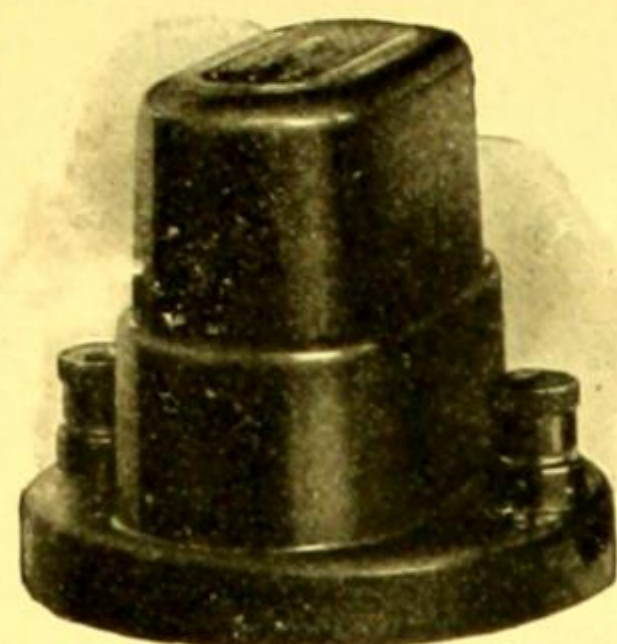


No. 1000.

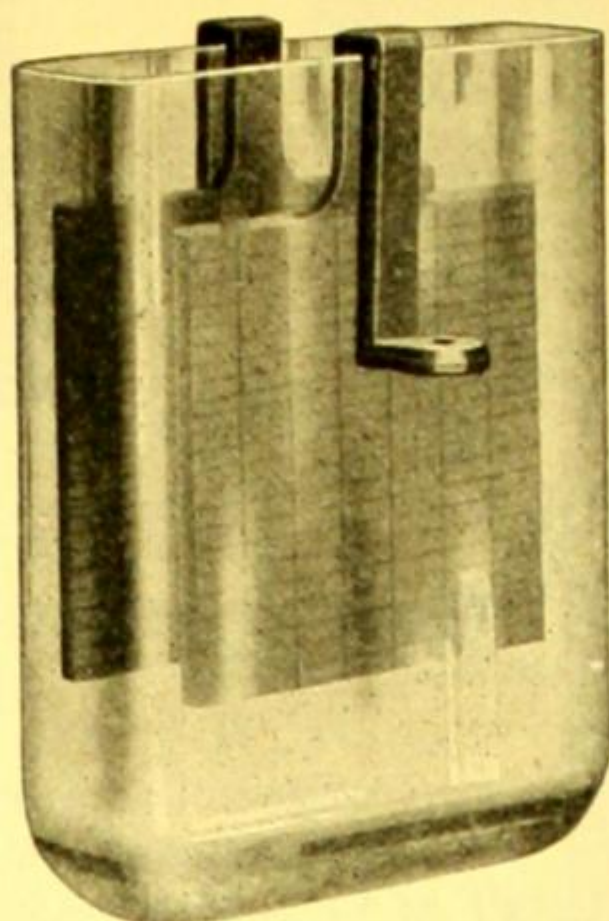
1000. **BATTERY, Cenco Plunge, Single Cell.** A powerful, compact form of the bichromate battery, expressly designed for laboratory and lecture table work. Elements can be quickly lifted out of the solution when not in use. Fiber top, with nickel-plated brass trimmings. Large zinc and carbon elements placed close together, reducing the internal resistance to a minimum. Initial E. M. F., about 2 volts; internal resistance when freshly charged, 0.15 ohms. \$ 4.00
1001. **BATTERY, Cenco Plunge, Two Cells,** in case with handles 10.00
1002. **BATTERY, Cenco Plunge, Four Cells,** in case with handles 18.50
1003. **BATTERY, Cenco Plunge, Six Cells,** in case with handles 27.00
1004. **CARBON PLATE** for Cenco Plunge Battery, 4x3x $\frac{1}{4}$ inches35
1005. **ZINC PLATE** for Cenco Plunge Battery, 4 $\frac{1}{8}$ x3x $\frac{1}{4}$ inches50
1006. **GLASS JAR** for Cenco Plunge Battery, 4x4x8 inches65
1008. **BATTERY, Laboratory Plunge, Four Cells.** Similar in construction to the Cenco Plunge Battery described above, the essential difference being in the elements, which are larger, and the case, which has an easy lifting motion, with a deadfall catch not liable to slip. The elements are quickly removed from the solution. Each cell may be used singly, two or more in series, or in parallel. Any cell which is not required for use can be suspended by the hook from the axle. All parts are interchangeable. Unquestionably the best battery for the lecture table. Initial E. M. F., about 2 volts per cell; internal resistance when freshly charged, 0.15 ohms. Complete with case 22.75
1011. **CARBON PLATE** for Laboratory Plunge Battery, 6 $\frac{1}{2}$ x2 $\frac{1}{2}$ x $\frac{1}{4}$ inches60
1012. **ZINC PLATE** for Laboratory Plunge Battery, 6 $\frac{1}{4}$ x2 $\frac{1}{2}$ x $\frac{1}{4}$ inches60
1013. **ELEMENTS COMPLETE** for Laboratory Plunge Battery. Two carbon plates, zinc plate, fiber top, binding posts and hooks 2.75
1014. **GLASS JAR** for Laboratory Plunge Battery, 2 $\frac{1}{2}$ x4 $\frac{1}{4}$ x7 inches60
1016. **BATTERY, Samson No. 2.** A popular battery for open circuit work. It is the best, most durable and effective of all cells of the carbon cylinder type. Recuperates very quickly. Dimensions over all, 4 $\frac{1}{2}$ x4 $\frac{1}{2}$ x8 inches. E. M. F., 1.5 volts. Internal resistance about 0.07 ohms. Complete with chemicals 2.75
1017. **CARBON,** for No. 1016 1.50
1018. **ZINC CYLINDER,** for No. 101670
1019. **GLASS JAR,** for No. 101675



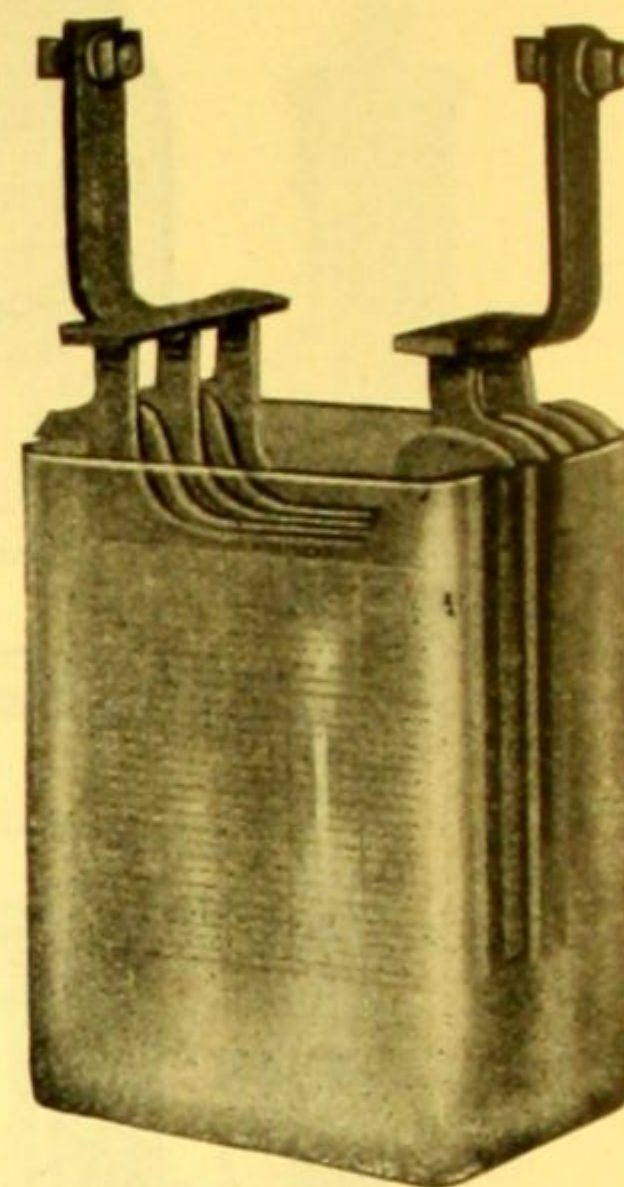
No. 1028.



No. 1032.



No. 1036A-D.



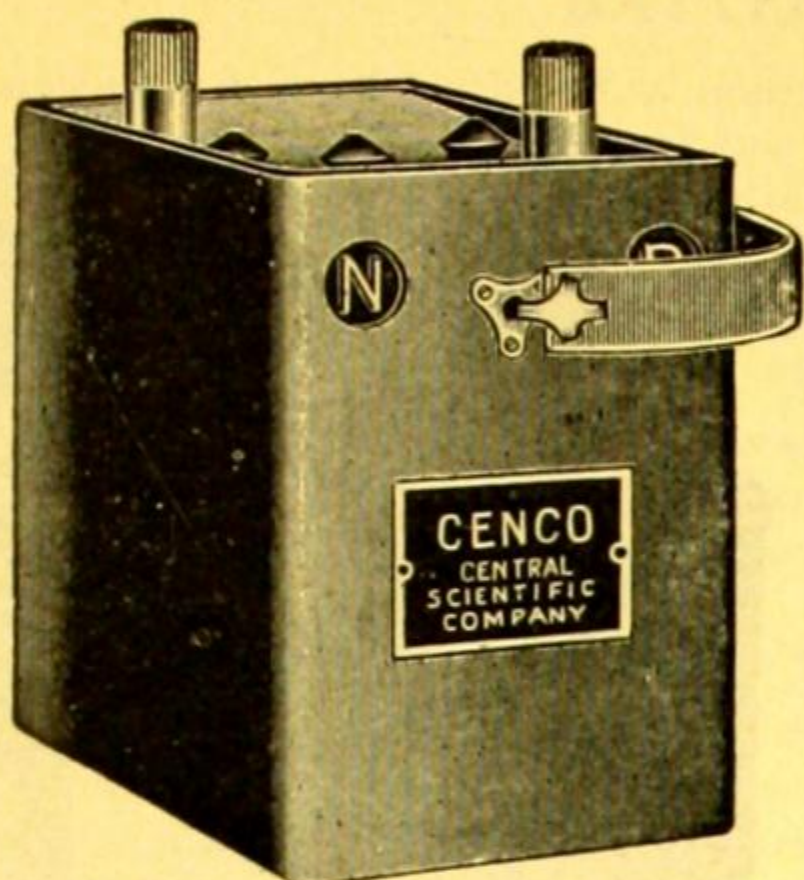
No. 1036E.

1026. **BATTERY, Standard Cell**, glass part only, with platinum wires, for those desiring to make their own standard cells. This is the regular H form and may be used to make any of the ordinary forms of standards. \$1.50
1027. **BATTERY, Standard Cell**, glass part only, without platinum wires.90
1028. **BATTERY, Standard Cell**, same as No. 1026, on stand as illustrated. 3.50
1031. **BATTERY, Standard Cell, Student Type**, see page 388.
1032. **BATTERY, Standard Cell, Weston**, unsaturated type, Model 4. Consists of an H-shaped receptacle with platinum leads which pass through the bottom. One limb of the cell contains cadmium amalgam; the other mercury and a paste of mercurous sulphate. The cell is filled to slightly above its cross arm with an unsaturated solution of cadmium sulphate and sealed to prevent evaporation. Porcelain separators prevent the ingredients from becoming mixed. E. M. F. between 1.0184 and 1.0189 volts. With manufacturers' certificate of voltage. 25.00
1033. **BATTERY, Standard Cell, Weston**. Same as No. 1032, but with Bureau of Standards certificate. 29.50

BATTERIES, STORAGE

BATTERIES, Cenco Storage. These batteries, which are made for us by one of the most reliable manufacturers, have been used extensively for years with increasing satisfaction in all classes of service. The different sizes in each class have the same plate construction, the only difference being in the size and capacity of the plates or elements. The voltage is approximately two volts at the beginning of discharge. Each battery is guaranteed against electrical or mechanical defects, and within the discharge rates specified they will give their full rated capacities. When charged at the normal rate given for 8-hour discharge rate the cells will be charged in 9 hours. Full directions will be sent with each battery for its charging and proper care.

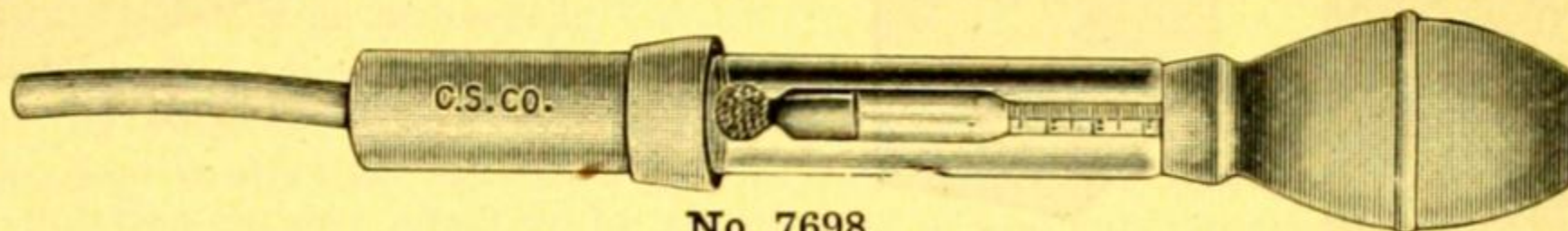
No.	A	B	C	D	E	F	G	H	J	K	L
No. of plates.....	2	2	2	2	5	7	9	7	9	11	13
Size of plates.....	3x4	5x5	7x5	8 $\frac{3}{4}$ x5	5 $\frac{3}{4}$ x6	5 $\frac{3}{4}$ x6	5 $\frac{3}{4}$ x6	7 $\frac{3}{4}$ x7 $\frac{3}{4}$	7 $\frac{3}{4}$ x7 $\frac{3}{4}$	7 $\frac{3}{4}$ x7 $\frac{3}{4}$	7 $\frac{3}{4}$ x7 $\frac{3}{4}$
Output at normal discharge rate, ampere hours.....	8	16	24	32	64	96	128	180	240	300	360
Charging rate, amperes...	1	2	3	4	8	12	16	22 $\frac{1}{2}$	30	37 $\frac{1}{2}$	45
Discharge rate for 8 hours, amperes	1	2	3	4	8	12	16	22 $\frac{1}{2}$	30	37 $\frac{1}{2}$	45
Discharge rate for 5 hours, amperes	1 $\frac{1}{2}$	3	4 $\frac{1}{2}$	6	10	15	20	30	40	50	60
Length of jar, inches.....	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2 $\frac{7}{8}$	2 $\frac{7}{8}$	4 $\frac{3}{4}$	6 $\frac{3}{8}$	7 $\frac{5}{8}$	6 $\frac{3}{4}$	8	8 $\frac{3}{4}$	11 $\frac{1}{4}$
Width of jar, inches.....	3 $\frac{7}{8}$	7 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{7}{8}$	7 $\frac{7}{8}$	7 $\frac{5}{8}$	9 $\frac{1}{4}$	9 $\frac{1}{8}$	9 $\frac{1}{8}$	9 $\frac{1}{8}$
Height of jar, inches.....	6 $\frac{1}{2}$	9	12	12	9 $\frac{1}{2}$	9 $\frac{1}{2}$	9 $\frac{1}{2}$	12	12	12	12
Weight of cell, complete with electrolyte, lbs.....	4	7 $\frac{1}{2}$	11	13 $\frac{1}{2}$	30	39	49	51	63	79	96
1036. COMPLETE CELL , without electrolyte	2.35	3.80	4.15	4.60	11.40	15.15	18.30	21.45	26.40	31.80	38.80
1037. GLASS JAR , only											
Each	.65	1.85	1.85	1.85	3.15	3.85	4.00	4.80	5.10	6.00	8.60



No. 1040.



No. 1042.



No. 7698.

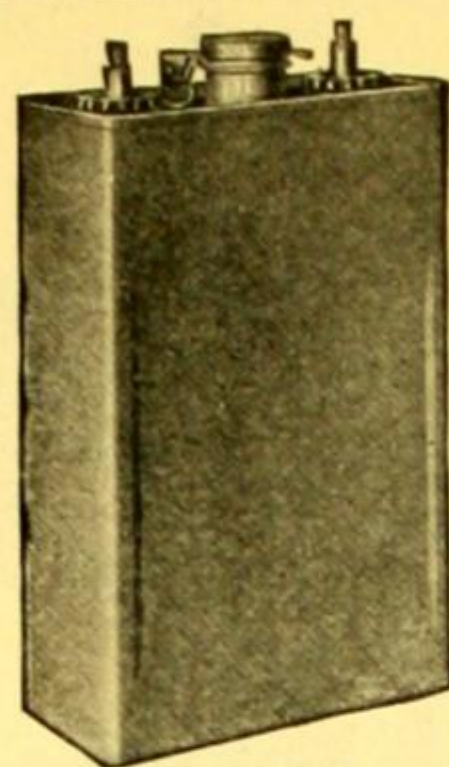
BATTERIES, Cenco Portable Storage. These batteries are of the same general type as the Cenco Storage Batteries described on the preceding page, but are especially made to stand transportation. Under ordinary conditions they should last for at least five years, and they are guaranteed for one year against everything except abusive handling. The jars are of the best vulcanite, and are enclosed in hardwood cases provided with a handle and finished with acid-proof paint. Strength is added to the jar when placed in the case by entirely surrounding it with an elastic sealing compound. Short circuiting is prevented by an exceptionally wide distance between the plates. The acid cannot spill under any ordinary conditions of service. Batteries are charged ready for use. Initial E. M. F., 6 volts.

No.	A	B	C	D
Output at normal discharge rate, ampere hours	40	60	80	120
Charging rate, amperes	4½	6	7	8½
Discharge rate for 8 hours, amperes.....	5	7½	10	15
Length, inches	8½	10	11	14¾
Width, inches	5	6	7	7¼
Height, inches	9	9¼	9¼	9¼
Weight of cell, complete with electrolyte, lbs.....	23	35	45	66
1040. COMPLETE CELL, charged.....	\$22.50	29.00	30.00	43.00

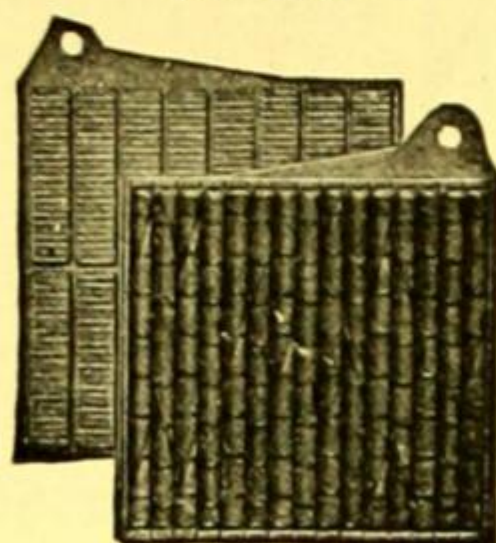
BATTERIES, Cenco Sealed Storage. These batteries are contained in glass jars, sealed with a smooth and strong compound, and are ideal for isolated and portable work where care in handling may be given. They are especially desirable for clock and bell systems, and for demonstration work. Each cell is made up with a negative plate on either side of the positive, giving equal action on each side and preventing buckling and sulphation. The sealing compound prevents evaporation of the electrolyte and keeps the cell clean at all times. The batteries are shipped completely assembled and charged ready for immediate use. Initial E. M. F., 2 volts.

No.	A	B	C	D
Output at normal discharge rate, ampere hours	8	16	44	66
Output at intermittent rate, ampere hours.....	12	23	65	95
Charging rate, amperes	1¼	2½	5	8
Discharge rate for 8 hours, amperes.....	1	2	4½	7
Number of plates per cell.....	3	5	5	7
Length, inches	4	4	6¼	6¼
Width, inches	2½	2½	3	3
Height, inches	6½	6½	9½	9½
Shipping weight, complete with electrolyte, lbs...	10	11	18	23
1042. COMPLETE CELL, charged.....	5.00	6.25	9.40	12.00

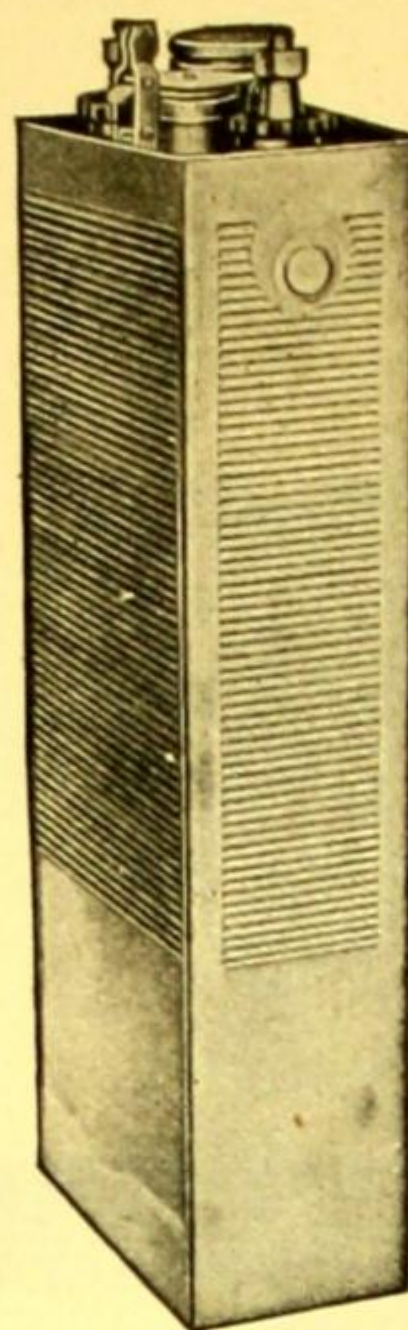
7698. **BATTERY TESTER, or Syringe Battery Hydrometer.** A very convenient form of battery hydrometer, which eliminates the spilling of acid when making a battery test. The pointed tube is inserted into the battery and the electrolyte drawn up into the hydrometer containing tube by means of the rubber bulb. After the reading is obtained the fluid is ejected back into the battery. Complete table showing relation between specific gravity and battery strength included70



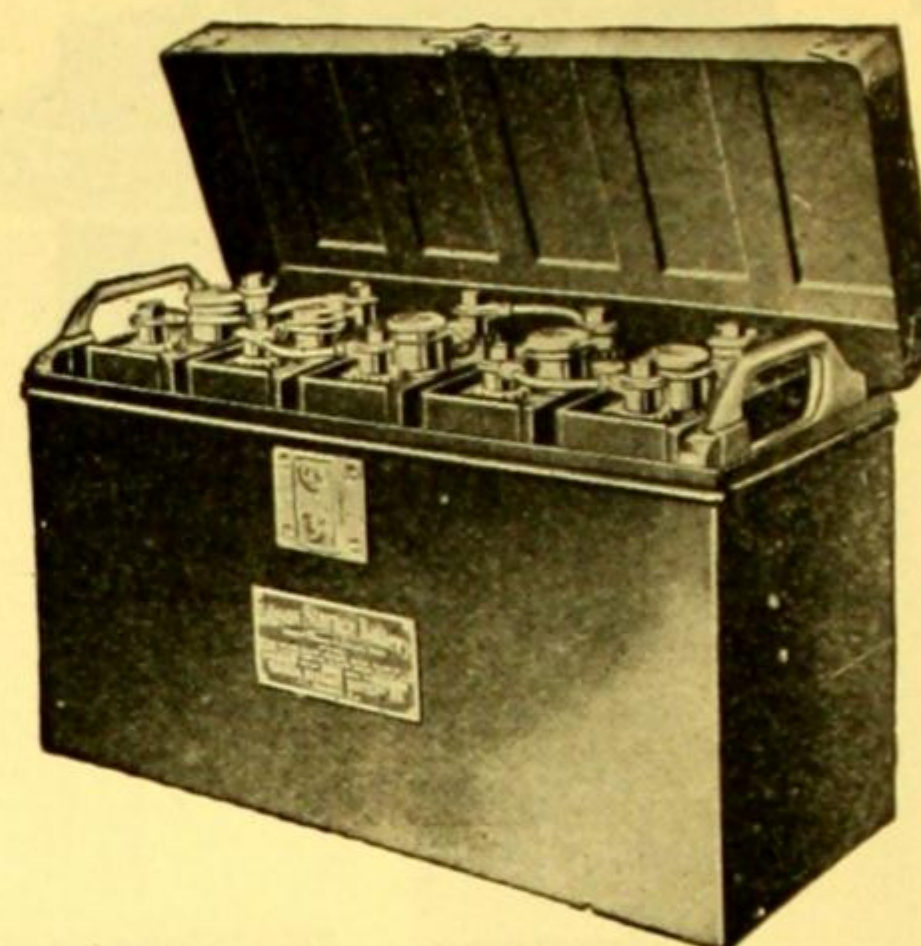
No. 1049C.



Plates of No. 1048C.



No. 1048E.



No. 1050A.

BATTERIES, Edison Storage. These batteries are composed of negative plates of iron oxide and positive plates of nickel oxide immersed in an alkaline solution. The retaining cans are of corrugated sheet steel, welded at the seams, and electroplated with nickel, which protects the steel from rust and gives each cell an attractive appearance. They are made in two types: Type "A" for heavy current duty; Type "B" for lighter work, such as for ignition, small lighting outfits, clocks, bells, etc. These batteries are guaranteed for five years if directions are carefully followed. Voltage on open circuit, 1.2.

DISTINCTIVE FEATURES.

Light weight and small space occupied. Freedom from obnoxious fumes.
No sulphating or deterioration on open circuit. No injury from short circuits.
No breakage of containers. Low maintenance cost.
Extremely long life in service.

Freedom from sensitiveness to external conditions such as temperature, vibration, concussion, etc.

Number	A	B	C	D	E
Type	B1-H	B-2	B-4	B-6	A-4
No. of positive plates	1	2	4	6	4
Output at normal discharge rate, ampere hours	18.75	37.5	75.0	112.5	150.0
Charging rate, amperes	3.75	7.5	15.0	22.5	30.0
Discharge rate for 8 hours, amperes	2.25	4.75	9.5	14.0	18.5
Discharge rate for 5 hours, amperes	3.75	7.5	15.0	22.5	30.0
Mean effective internal resistance, ohms	.024	.012	.006	.004	.003
Length of jar, inches	1.55	1.55	2.58	3.75	2.64
Width of jar, inches	5.03	5.03	5.09	5.09	5.13
Height of complete cell, inches	10.44	8.69	8.69	8.78	13.38
Weight of renewal solution per cell, lbs.	2.0	1.0	1.7	2.5	2.9
Weight of cell, complete with electrolyte, lbs.	4.9	4.7	7.5	10.8	13.9
1048. COMPLETE CELL, with electrolyte, but not charged.	\$6.50	8.50	11.75	16.00	20.00

BATTERIES, Edison Storage, supplied in sets of five, assembled in standard suspension trays contained in a steel battery box. The initial voltage of each set is 6 volts and the direct current voltage necessary to charge is 9.

No.	A	B
Type	B-2	B-4
Output at normal discharge rate, ampere hours	37.5	75
Charging rate, amperes	7.5	15
Weight, lbs., in tray	27	41.5
Height, inches	10 1/4	10 1/4
Width, inches	7 5/8	7 5/8
Length, inches	11 7/8	17 3/8
1050. BATTERY, complete in box	47.25	63.50
1051. ELECTROLYTE for renewal of Edison Storage Batteries. In cans.		
No.	A	B
No. of pounds in can	2	5
Per can	1.00	1.90

BATTERY DIRECTIONS

Amalgamating. A good method for amalgamating a zinc element is to dip it into acid, then pour a few drops of mercury on the surface and rub in with a piece of cloth attached to a stick. This is perhaps the best and quickest method although the most expensive.

Amalgamating Fluid. 2 ounces mercury, 1 ounce aqua regia, 10 ounces water. Dip zinc into solution and then wash with water. No need of brush or rag. Zinc element should be thoroughly cleaned before amalgamating by means of a metal scratch brush or coarse emery cloth.

Bunsen Battery. Outer cell contains amalgamated zinc plate dipping into dilute sulphuric acid (by weight 10 parts water to 1 part acid). In inner porous cup, a piece of carbon dips into nitric acid of full strength. Obnoxious nitrogen oxide fumes may be suppressed in a large measure by the addition of a small quantity of potassium dichromate. If desired the nitric acid may be replaced by a chromic acid solution. (See Sulpho-Chromic Salt below.)

Burn-Boston Battery. To make active, ready for use, add plain water.

Carbon Cylinder Battery. Place 6 ounces ammonium chloride in jar and fill with water to two-thirds its capacity. Stir well until the salt is entirely dissolved. Place elements with zinc inside carbon cylinder as illustrated.

Columbia Dry Battery. Should be entirely discarded after its amperage has dropped to a point unfitting it for use, as it cannot be recharged.

Daniell Battery. The zinc element is placed in a porous cup containing sulphuric acid (1 part acid to 20 parts water, by weight). The copper element encircles a porous cup and dips into saturated copper sulphate solution, kept continually saturated by the addition of an excess of copper sulphate crystals on bottom of jar. Solution is more effective by addition of a few cubic centimeters of sulphuric acid.

(In our No. 958 a pocket is provided for holding excess crystals of copper sulphate.)

Edison Primary Battery. The exhaustion of the cell is indicated by holes appearing in the lower part of the zinc plates. When this point is reached, a complete renewal (see No. 967) should be obtained as the parts are so proportioned that all become exhausted at the same time. Directions are furnished with each renewal.

Fuller Battery. Fill glass jar half full of chromic acid solution made from Sulpho-Chromic Salt (see below), place 1 teaspoonful mercury and 2 tablespoons full of common salt in the porous cup and fill with water to 1½ inches of top. The carbon element containing the porous cup is then placed in the glass jar, the zinc is placed in the glass jar and the cover over it. The solution should fill the glass jar to within an inch of the top.

Gravity Battery. This type of battery is merely a form of Daniell cell, where the two solutions are kept separate by their difference in specific gravity. Place 2 pounds copper sulphate crystals in bottom of jar with copper element. Add clear water to fill the jar when elements are in position. Suspend zinc over edge of jar and connect the two plates through a resistance of 10 ohms or more. When the solutions have separated, that around the zinc plate being colorless, while that around the copper is blue, the cell is ready for action. If during this time the zinc plate has become covered with precipitated copper, it should be taken out and brushed off until the surface is bright. The separation of the two solutions may be hastened by adding some crystals of zinc sulphate or a small amount of dilute sulphuric acid.

Grenet Battery. In this cell, the zinc plate between two carbon plates dips into a chromic acid solution. (See below.) When this cell is exhausted, the rich reddish color of chromic acid will be replaced by a muddy dark green color.

Chromic Acid Solution. There are many different formulae, but the most convenient method of making a generally useful acid is by simply dissolving prepared chromic acid salt in water. (See Sulpho-Chromic Salt, below.)

A useful formula is, 30 parts sodium dichromate, 100 parts water and 23 parts sulphuric acid (sp. gr. 1.845); all by weight.

LeClanche Battery. Directions furnished under carbon cylinder cell apply to this type of cell, except that zinc rod is placed outside of porous cup.

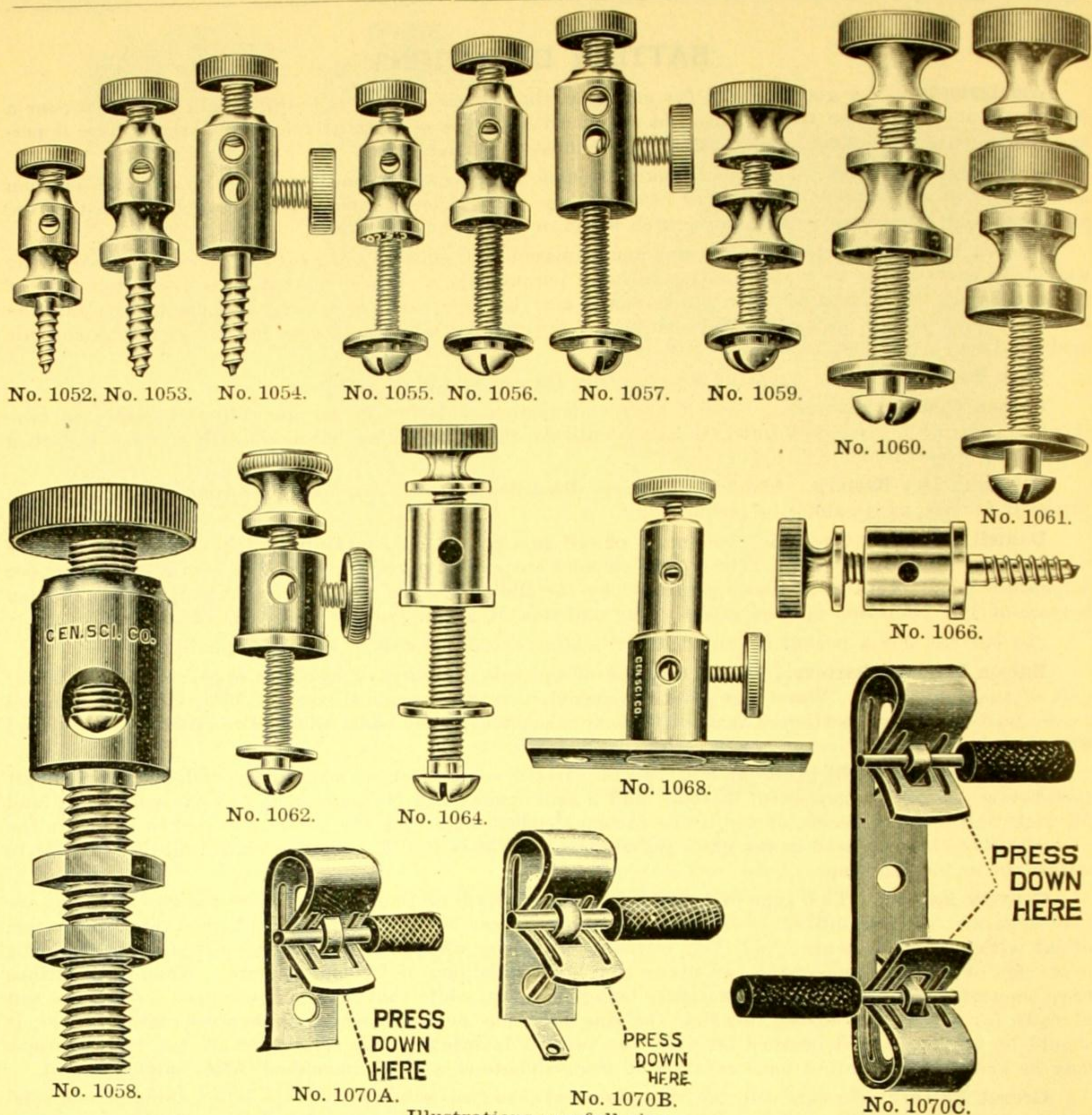
Plunge Battery. Elements and directions under Grenet type apply to this type of battery.

Samson Battery. Directions furnished under carbon cylinder cell apply to this type of cell.

Storage Batteries. These cells make the most convenient source of electrical supply, providing the laboratory is equipped for charging. Full directions for use and for charging accompany each cell.

BATTERY FLUID

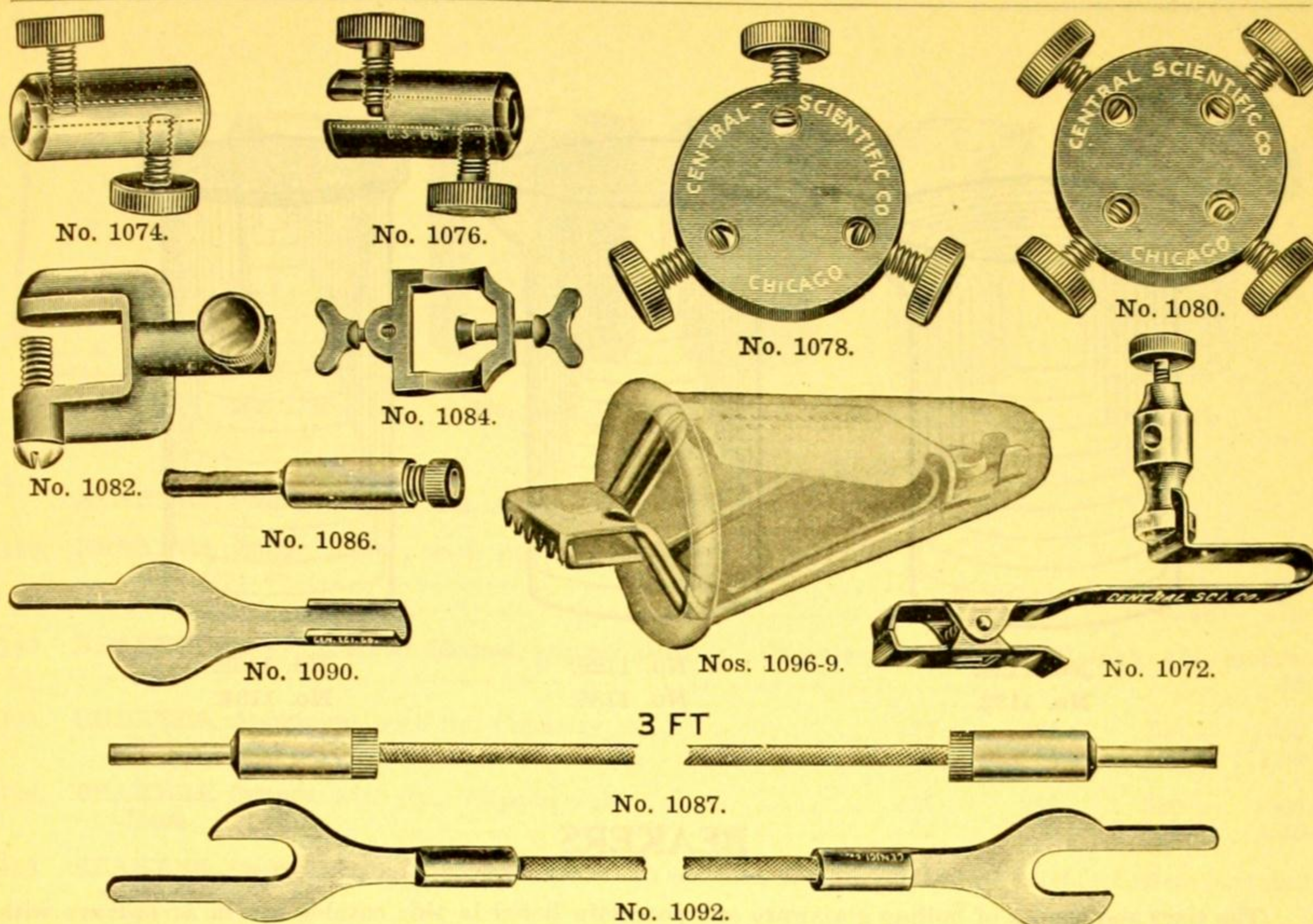
CENCO SULPHO-CHROMIC SALT. (Formula patented.) For making battery fluid for plunge batteries and Grenet cells and to replace the nitric acid in Grove and Bunsen cells it will be found that Cenco Sulpho-Chromic Salt is without an equal. Its use does away with all handling of acids in liquid form. One jar (2 lbs.) is sufficient for three quarts of battery fluid.....Per jar \$0.80



Illustrations are full size.

BATTERY BINDING POSTS

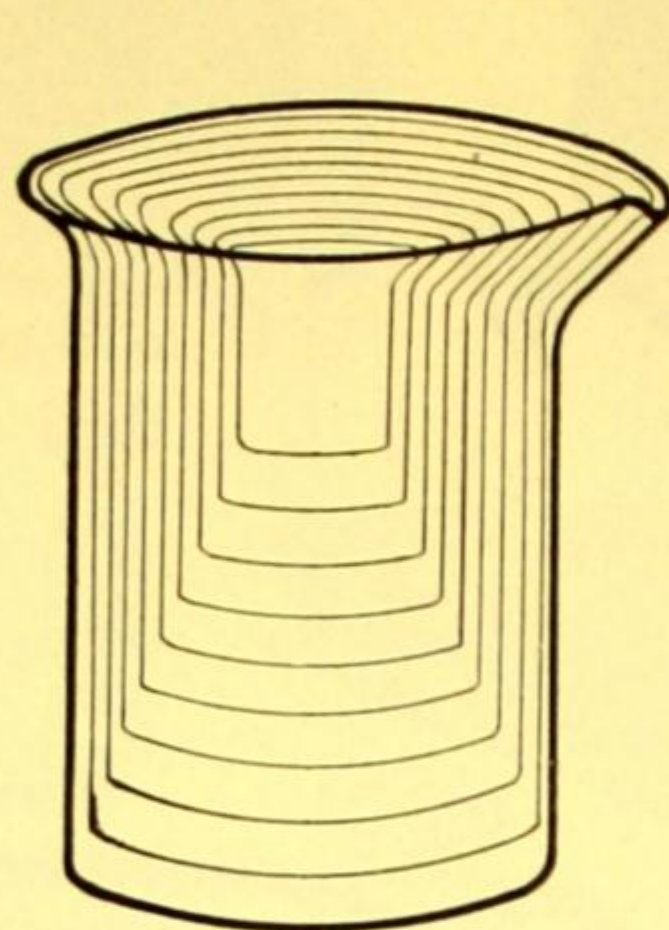
1052. BINDING POST,	American form, with wood screw, small	.....	\$0.10
1053. BINDING POST,	American form, with wood screw, large	.....	.15
1054. BINDING POST,	American form, with wood screw, double	.....	.20
1055. BINDING POST,	American form, with machine screw, small	.....	.10
1056. BINDING POST,	American form, with machine screw, large	.....	.15
1057. BINDING POST,	American form, with machine screw, double	.....	.20
1058. BINDING POST,	American form, extra heavy with two nuts for attaching to board or table top	.....	.90
1059. BINDING POST,	English form, with machine screw, small	.....	.12
1060. BINDING POST,	English form, with machine screw, large	.....	.20
1061. BINDING POST,	English form, with machine screw, large, double	.....	.25
1062. BINDING POST,	combined American and English form, with machine screw	.....	.25
1064. BINDING POST,	new form, combined American and English, with machine screw	.....	.25
1066. BINDING POST,	new form, combined American and English, with wood screw	.....	.25
1068. BINDING POST,	with plate for wood screws, double	.....	.50
10% discount on any of the above binding posts Nos. 1052 to 1068 in lots of 12.			
1070. BINDING POST,	Spring, of brass, Fahnestock Patent.	Will take any size wire up to No. 10 B. &	
S. gage. Styles A and B are identical, except B is provided with a lug to which wire may be soldered.			
Style C is double. No. _____			
Length, inches _____		A	B
Width, inches _____		1 1/16	1 1/16
Each _____		3/8	3/8
		.05	.06
			.07
25% discount in lots of 100.			



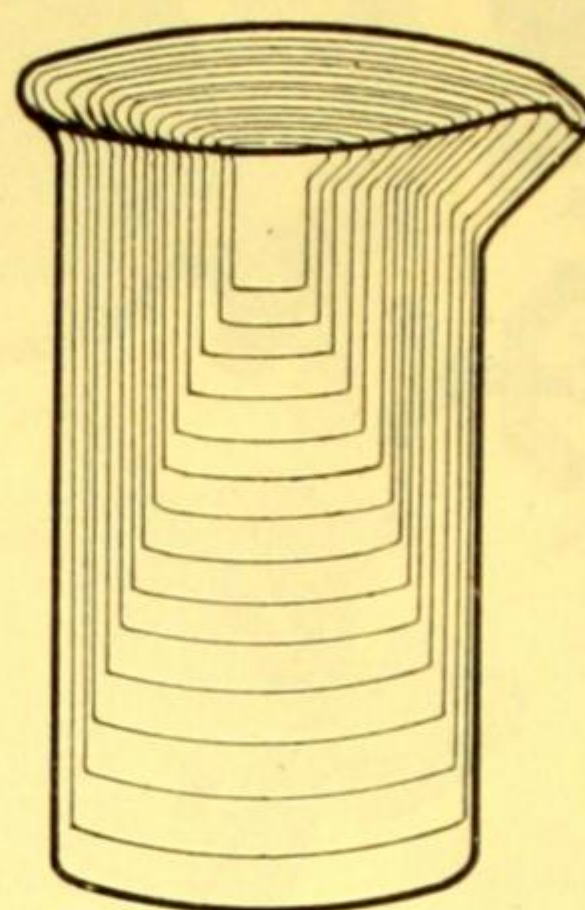
BATTERY CONNECTORS

Illustrations are full size.

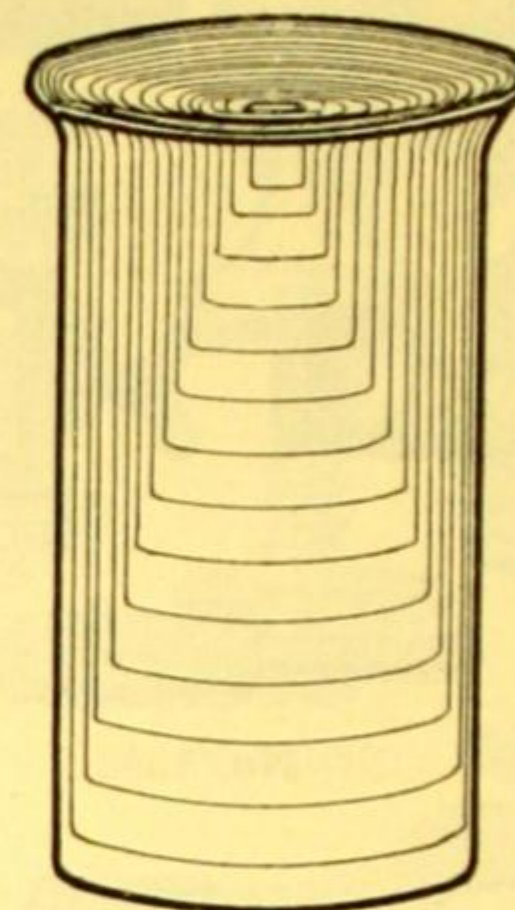
1072. **CONNECTOR, Clip**, for holding small electrodes in experimental work on electroplating. A small American binding post soldered to a spring clip; handle of clip bent to hang over edge of battery jar or tumbler..... \$0.25
1074. **CONNECTOR**, double..... .12
1076. **CONNECTOR**, double; one end for wire and other slotted for receiving plates $\frac{1}{8}$ -inch thick or less..... .20
1078. **CONNECTOR**, triple..... .30
1080. **CONNECTOR**, quadruple..... .35
1082. **CONNECTOR**, for zinc..... .30
1084. **CONNECTOR**, for carbon..... .30
1086. **CONNECTOR TIP**, for use in making connections with American binding posts..... .12
1087. **CONNECTOR**, consists of two No. 1086 connector tips attached to ends of 3 feet of flexible silk cord..... .50
1090. **CONNECTOR TIP, Universal**, for use in connecting to either English or American binding posts. Very convenient. To be soldered to cord..... .05
1092. **CONNECTORS**, consisting of two No. 1090 Connector Tips soldered to the ends of flexible silk cord.
- | No. | A | B |
|-----------------------------|-----|-----|
| Length of cord, inches..... | 6 | 36 |
| Each..... | .20 | .25 |
- 10% discount on the above binding posts Nos. 1072 to 1092 in lots of 12.
1094. **CORD, Flexible Silk**, as used on Nos. 1087 and 1092. For small currents.....per yard .10
- UNIVERSAL TEST CLIPS.** Time savers in any electrical work requiring quick temporary connections, since they may be attached to the ends of a connecting wire and used to make connections at any point by simply clipping on to binding posts or wire. Made of copper and may be used over and over again. Suggested for use with test sets, with voltmeters, on shop testing devices, as a helix clip, by meter departments, in college and commercial laboratories, on motor and transformer test floors, in motion picture projection work and in charging storage batteries. For storage battery work the lead plated clip No. 1098 should be specified.
1096. **TEST CLIP**, 20 ampere capacity, provided with binding post for attaching wire; spread of jaws, $\frac{7}{8}$ in. 25% discount in lots of 100.....each .20
1098. **TEST CLIP**. Same as No. 1096, but lead plated to prevent corrosion, particularly in storage battery work. 25% discount in lots of 100..... .16
1099. **INSULATOR**, for Nos. 1096 and 1098 Test Clips, of soft rubber. Shown in phantom in the illustration. 25% discount in lots of 100..... .10
1100. **CONNECTOR**, consists of two No. 1096 Test Clips, attached to the ends of 3 feet of flexible single lamp cord. Carrying capacity, 6 amperes..... .60
- BATTERY JARS**, see Jars, Nos. 8040 and 8042.
- BATTERY POROUS CUPS**, see general heading Batteries.
- BEADS, Glass**, see Nos. 7128 and 7129.



No. 1124.
No. 1132.



No. 1126.
No. 1136.



No. 1128.
No. 1134.

BEAKERS

The sizes and shapes of boiling glassware and porcelain listed in this catalog are in accordance with the recommendations of the Committee of the American Chemical Society on Guaranteed Reagents and Standard Apparatus. (See the reports of W. D. Collins, Chairman, published in the Journal of Industrial and Engineering Chemistry, Vol. XIII, No. 5, page 402 and No. 11, page 1070.) These sizes and shapes were adopted by the Association of Scientific Apparatus Makers of the United States of America at a recent conference called by the United States Department of Commerce at Washington as a part of the move toward standardization and elimination of unnecessary items now being urged by them upon all American industries. (For a general statement of our policy in this connection, refer to the foreword on page 7.)

1124. BEAKERS, Resistance Grade, Griffin's low form, with lip.

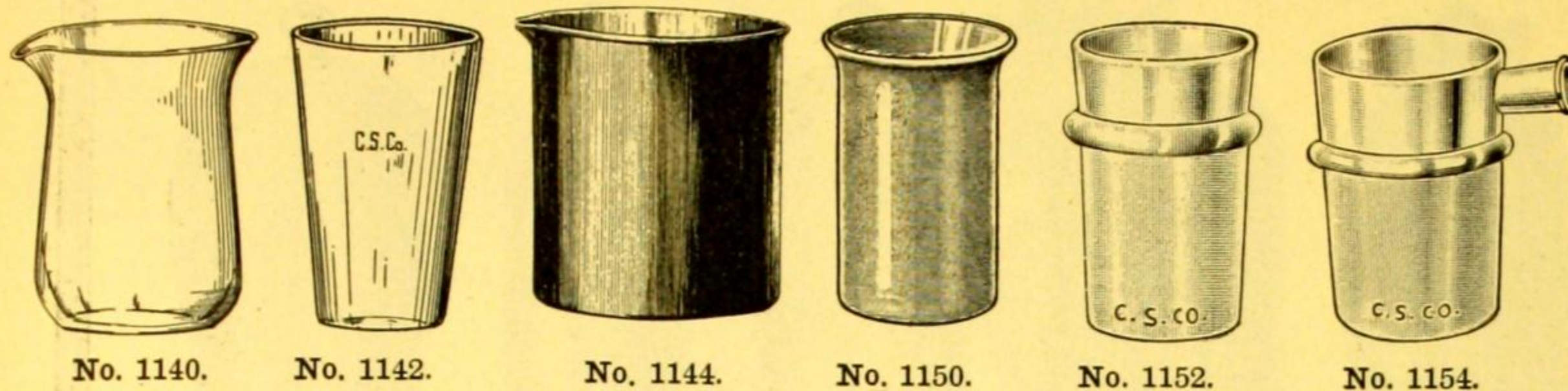
Capacity, cc	50	100	150	250	400	600	800	1000	2000
Number in original case	190	140	120	160	90	70	70	50	20
Each	\$ 0.12	.13	.14	.17	.20	.23	.27	.36	.75
Per original case	20.52	16.38	15.12	24.48	16.20	14.49	17.01	16.20	13.50

1132. BEAKERS, Pyrex Glass, Griffin's low form, with lip.

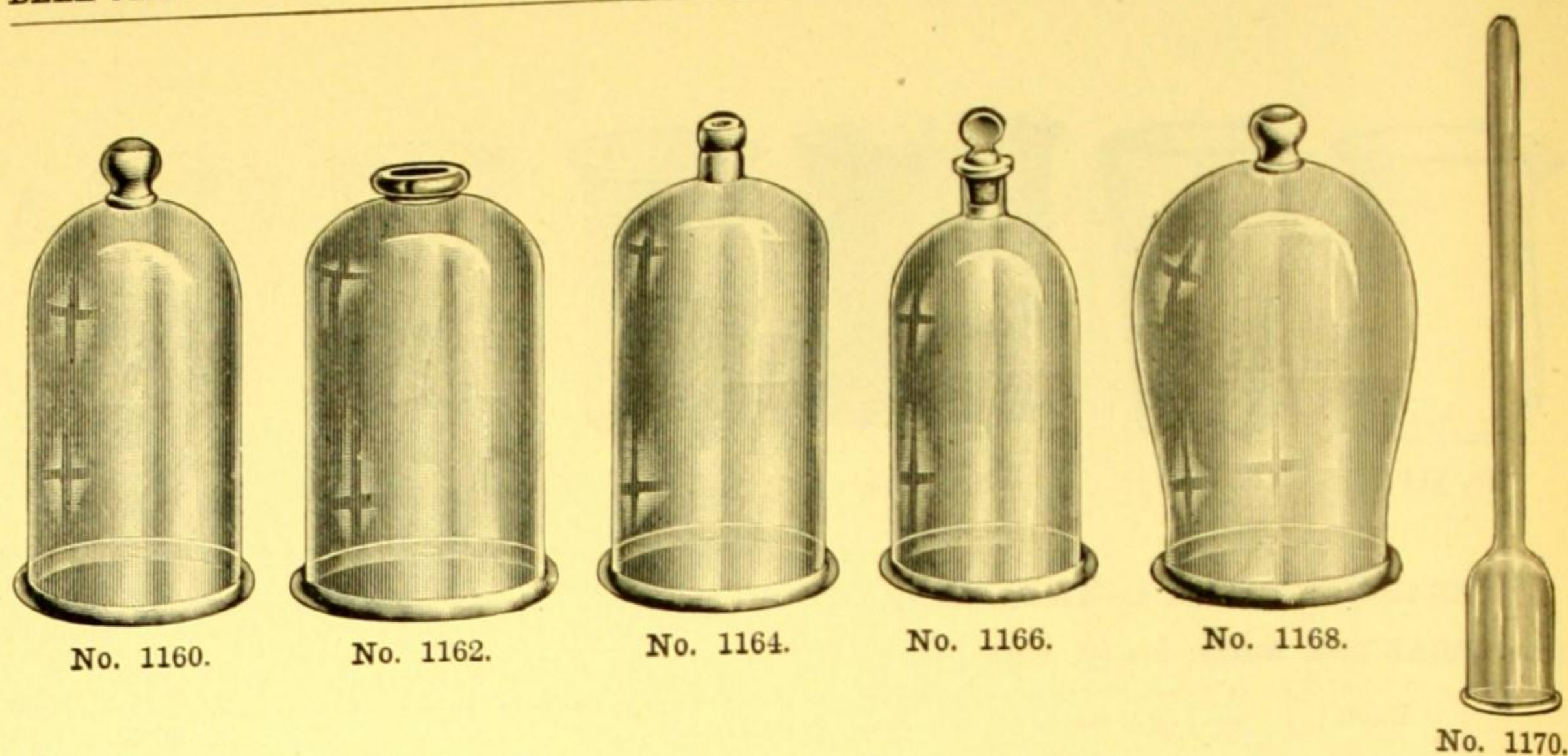
Capacity, cc.....	50	100	150	250	400	600	800
Number in original case.....	216	156	156	168	84	72	48
Each	.18	.19	.21	.25	.30	.35	.40
Per original case	34.99	26.67	29.48	37.80	22.68	22.68	17.28
Capacity, cc.....			1000	1500	2000	3000	4000
Number in original case.....			48	24	12	10	10
Each			.54	.73	.98	1.40	1.80
Per original case			23.32	15.76	10.58	12.60	16.20

1134. BEAKERS, Pyrex Glass, usual tall form, without lip.

Capacity, cc	100	200	300	400	500
Number in original case	156	168	144	60	60
Each	.19	.23	.26	.30	.32
Per original case	26.67	34.77	33.69	16.20	17.28

**BEAKERS, Phillips, see Flasks, Assay.**

1140. **BEAKERS, Sugar, heavy, with lip.**
Capacity, cc. 175 900
Each \$0.40 .70
1143. **BEAKER, Heavy, Tumbler Shaped, not for heating.** Capacity, 12 ounces. Height, 4 $\frac{3}{4}$ inches.
..... .15
1144. **BEAKERS, Aluminum, with lip.** Capacity, cc. 125 250 500 1000
Each40 .50 .60 1.00
1146. **BEAKERS, Copper, with lip.** Capacity, cc. 125 250 500 1000
Each60 .70 .90 1.20
1150. **BEAKERS, Coors Porcelain, glazed inside and outside, with exception of outside bottom surface, without lip.**
No. 2 3 3A 4
Capacity, cc 340 580 700 970
Diameter of body, mm. 69 82 90 100
Diameter of rim, mm. 74 87 93 103
Height, mm 118 143 154 167
Each 1.20 1.44 1.80 2.16
1152. **BEAKERS, Dye Pots, Coors Porcelain, with heavy supporting flange, glazed inside and outside with exception of outside bottom surface.**
No. A B C
Capacity, cc, to level of flange. 290 425 1125
Diameter rim, mm. 90 96 127
Diameter below flange, mm. 87 90 115
Distance rim to supporting flange, mm. 42 42 38
Height, mm 128 136 184
Each 1.44 2.10 3.30
1154. **BEAKERS, Dye Pots, Coors Porcelain, with heavy supporting flange and socket for wooden handle, glazed inside and outside with exception of outside bottom surface. Without lip.**
No. A B
Capacity, cc, to level of flange, mm. 290 425
Diameter, rim, mm. 86 96
Diameter below flange, mm. 80 118
Distance rim to supporting flange, mm. 42 42
Height, mm 128 136
Each 2.88 3.90
1156. **BEAKERS, Opaque Fused Silica, Griffin's low form with lip.** Capable of resisting temperatures up to about 1200°C. continuously, and unaffected by mineral or organic acids except hydrofluoric, and phosphoric at high temperatures. Alkalies in solution at low temperatures do not affect the ware, but at high temperatures or in fusions readily attack it. Its very low coefficient of expansion enables it to withstand sudden changes in temperature.
Capacity, cc 50 100 150 250 400
Each 2.65 2.90 3.35 3.95 5.00
1158. **BEAKERS, Transparent Quartz, with lip, prepared from rock crystal.** Melting point about 1600°C. Not attacked by water at room temperatures or at the boiling point. Less soluble in alkaline solutions than the best glass. Not attacked by dilute acids except hydrofluoric; concentrated sulphuric acid has no appreciable effect at 100°C.
Capacity, cc 50 100 200
Each 9.00 15.00 22.50



BELL JARS

All of our bell jars are made of clear glass and are well shaped. All rims are reground in our own factory, thus insuring a good contact with the pump plate, which is not possible with ordinary grinding.

1160. BELL JARS, High Straight Form, Knob Top, with reground rim.

No.	A	B	C	D	E
Height, inside, inches.....	9	11	15	15	18
Diameter, inside, inches.....	5	6	7	8½	9
Capacity, gallons	½	1	2	3	4
Each	\$2.20	3.20	4.00	6.50	8.75
20% discount in original case of.....	16	8	4	3	2

1162. BELL JARS, High Straight Form, Open Top, with reground rim and top ground flat.

No.	A	B	C
Height, inside, inches.....	9	11	15
Diameter, inside, inches.....	5	6½	7
Diameter of opening, inches.....	1	1¼	1½
Capacity, gallons	½	1	2
Each	2.40	3.20	4.50
20% discount in original case of.....	16	6	4

1164. BELL JAR, High Straight Form, Tubulated Top, to take No. 0 rubber stopper; with reground rim. Inside height, 11 inches; inside diameter, 6½ in.; capacity, 1 gallon..each 3.20
20% discount in original case of 6.

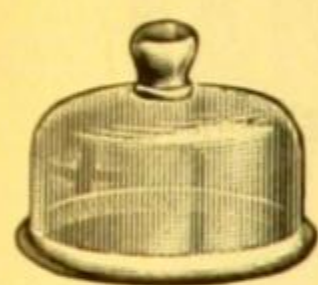
1166. BELL JARS, High Straight Form, Tubulated Top, with ground-in glass stopper and reground rim.

No.	A	B	C
Height, inside, inches.....	9	11	15
Diameter, inside, inches.....	5	6	7
Capacity, gallons	½	1	2
Each	2.40	3.20	4.50
20% discount in original case of.....	16	6	4

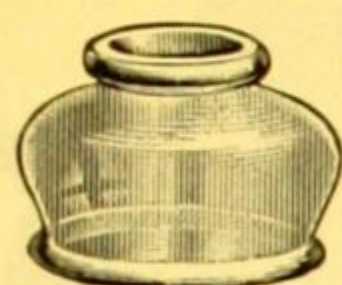
1168. BELL JARS, High Swelled Form, Knob Top, with reground rim.

No.	A	B
Height, inside, inches.....	10	12
Diameter, inside, inches.....	6	7
Capacity, gallons	1	2
Each	3.20	4.50
20% discount in original case of.....	12	6

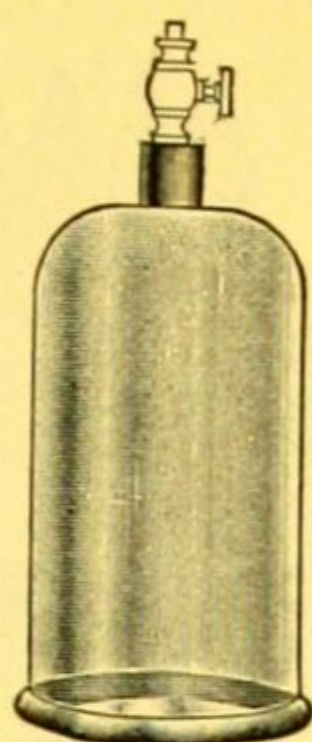
1170. BELL JAR, Extra High Form, with reground rim, for use with a full length barometer tube in studying the effect of reduced pressure on the barometric column..... 3.50



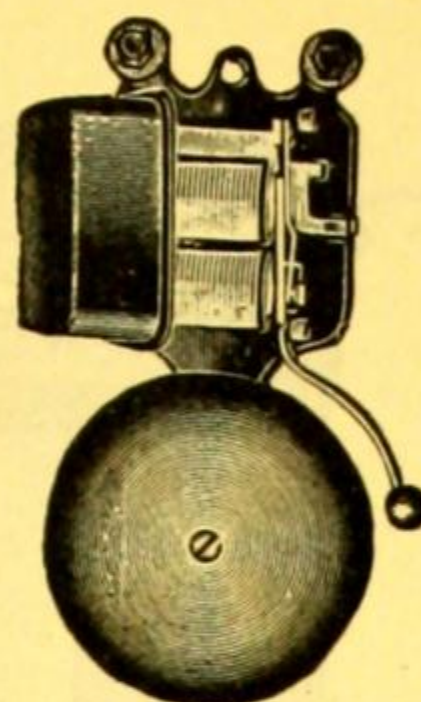
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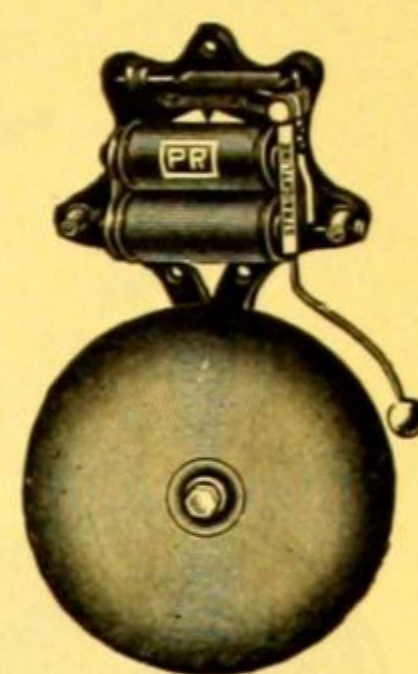
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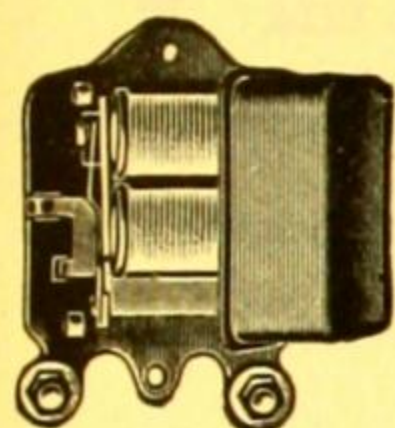
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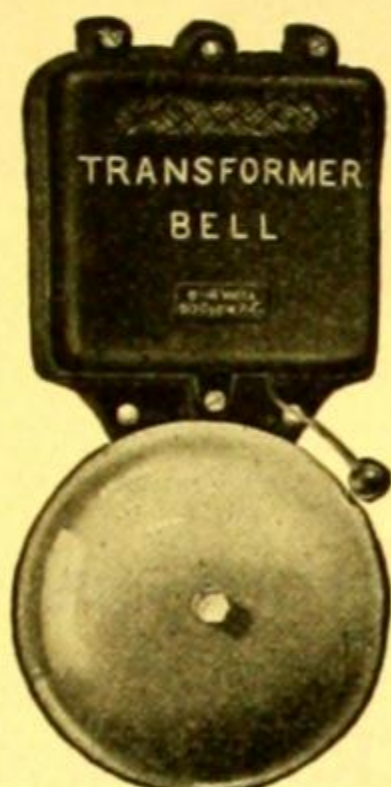
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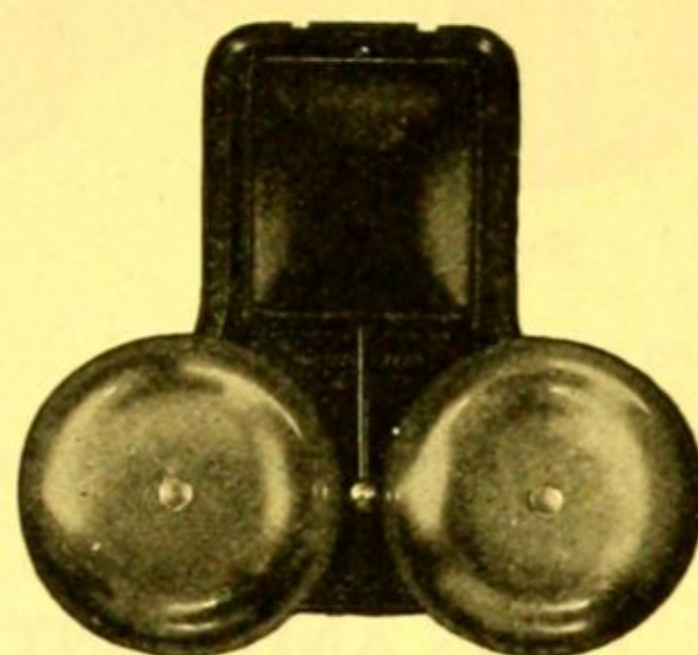
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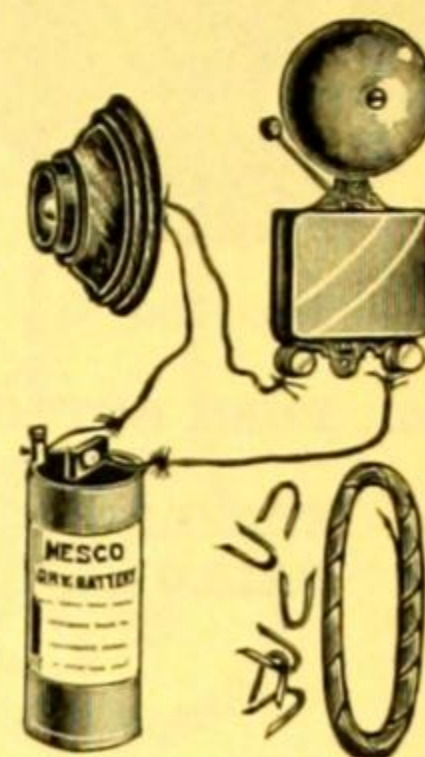
No. 1188.



No. 1190.



No. 1192.



No. 1196.

1172. BELL JARS, Low Straight Form, Knob Top, with reground rim.

No.	B	C	D	E	F
Height, inside, inches.....	3½	4	5	8	10
Diameter, inside, inches.....	5	6	8	10	12
Each	\$1.60	2.20	3.10	5.65	9.00
20% discount in original case of.....	36	28	12	3	2

1174. BELL JAR, Low Swelled Form, Open Top, (Hand and Bladder Glass), both rims ground. Diameter at the bottom rim, 4⅞ in.; height, 4 in. 2.70

1176. BELL JAR, Capped. No. 1164 fitted with a brass cap for receiving either stop-cock or a sliding rod. Capacity, 1 gallon. Without stop-cock or rod..... 6.50

1177. SLIDING ROD, with knob at one end and hook at the other for manipulation of apparatus inside of No. 1176 Bell Jar. Complete with packing screw, threaded 7/16-16..... 2.00

1184. BELLS, Electric, D. C. Iron box, pivoted armature. Voltage required, 6 volts; resistance, 6 ohms.
No. A C
Diameter of gong, inches..... 2½ 4
Each70 1.00

1186. BELLS, Electric, D. C., Skeleton Type. Pivoted armature, superior workmanship, nickel-plated gong giving clear, penetrating tone. Voltage required, 6 volts; resistance, 6 ohms.

No.	A	B
Diameter of gong, inches.....	4	6
Each	5.00	6.50

1188. BUZZER, Electric, D. C. Iron box..... .70

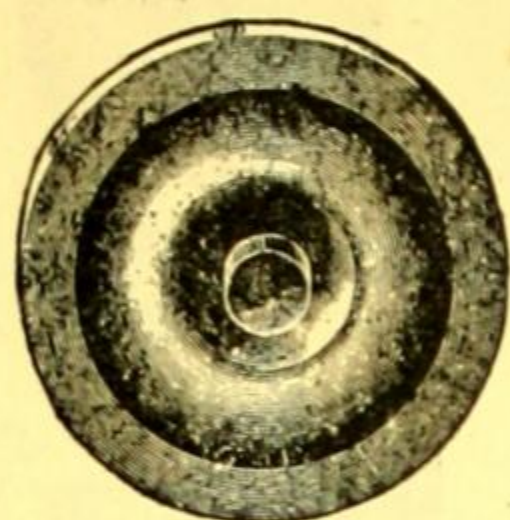
1190. BELLS, Electric, A. C., so-called Transformer Bells. For use on Nos. F3879 Bell Ringing Transformers on voltages from 6 to 18. Loud ringing dependable bells with carbon contacts, laminated field and cores, closed movement and insulated current carrying parts. Energy consumption, 6 to 8 watts. A 75 watt transformer will operate 10 bells connected in parallel.

No.	A	B
Diameter of gong, inches.....	3	4
Each	7.55	8.05

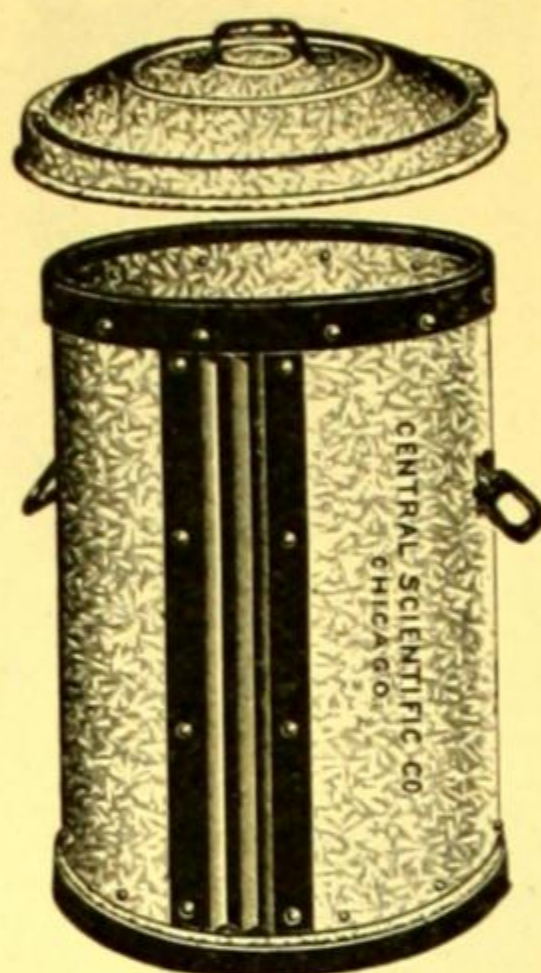
For TRANSFORMERS for use with No. 1190, see general heading **Electrical Instruments**.

1192. BELL, Electric, loud ringing, for outside service; entirely moisture proof; operates on 110 volt, 60 cycle, A. C. 6 inch gong; 300 ohms resistance 18.00

1196. ELECTRIC BELL OUTFIT, consisting of No. 1184A Bell, No. 964 Dry Battery, No. 1200 Push Button, 1 lb. (150 feet) annunciator wire, and staples for putting up..... 2.60



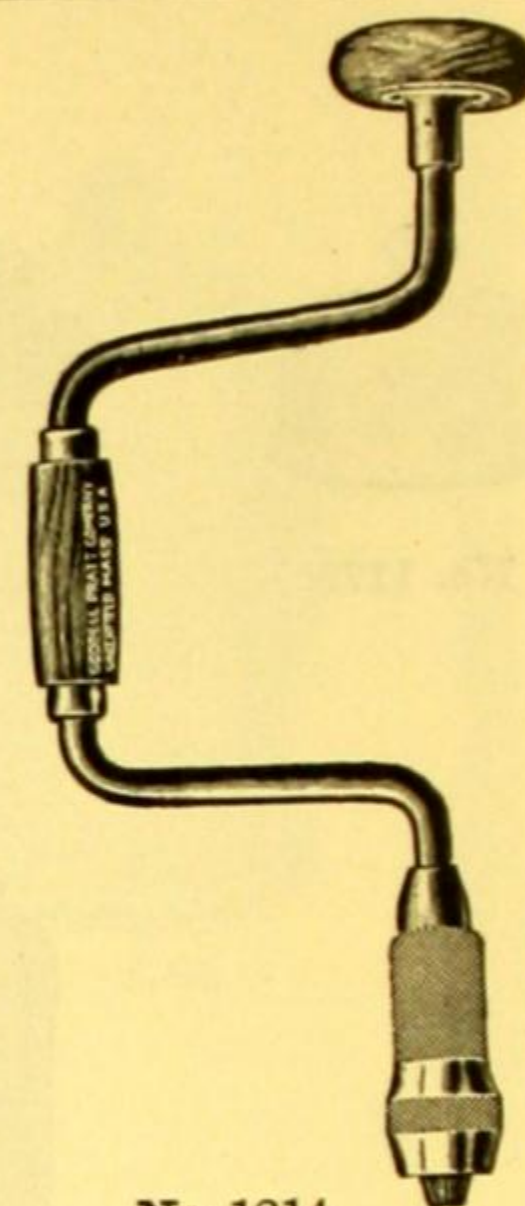
No. 1200.



No. 1208.



No. 1212.

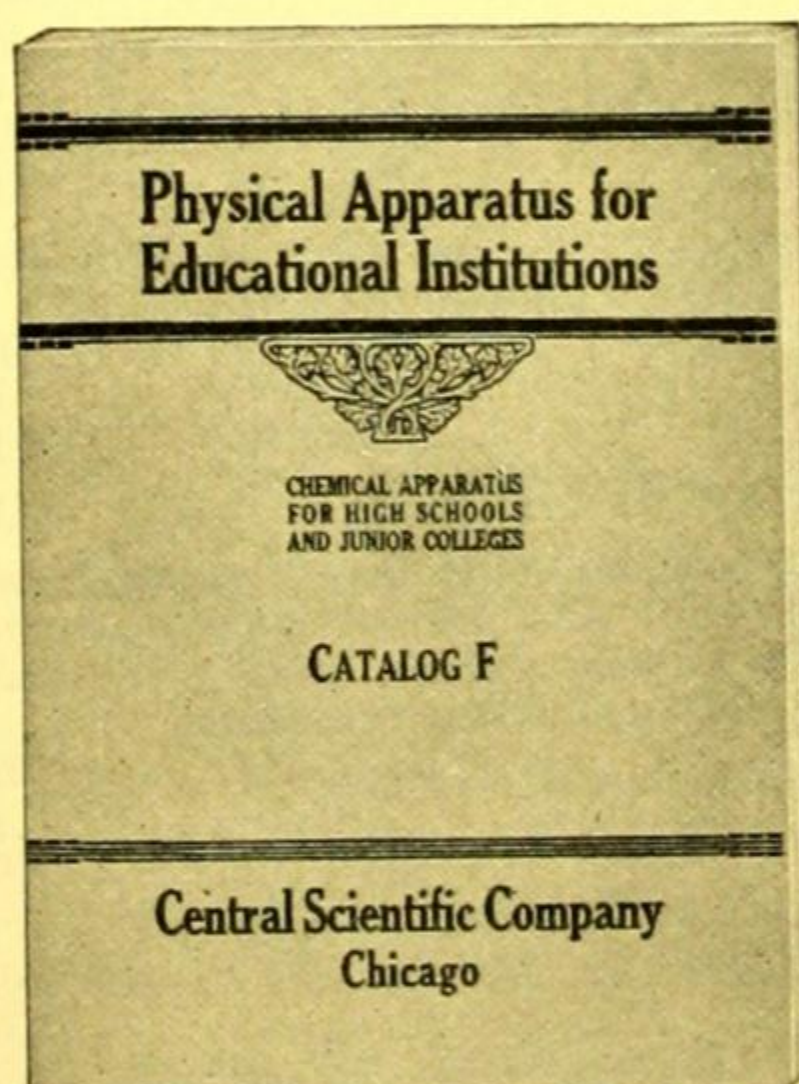


No. 1214.

1200. **PUSH BUTTON**, pressed metal, with screw cap each \$0.15
 20% discount in lots of 12.
1202. **STAPLES**, Wire, square top, $\frac{3}{8}$ -inch, for bell wiring. In 2 oz. packages.....per package .15
BELLOWS, Hand, see No. 1380.

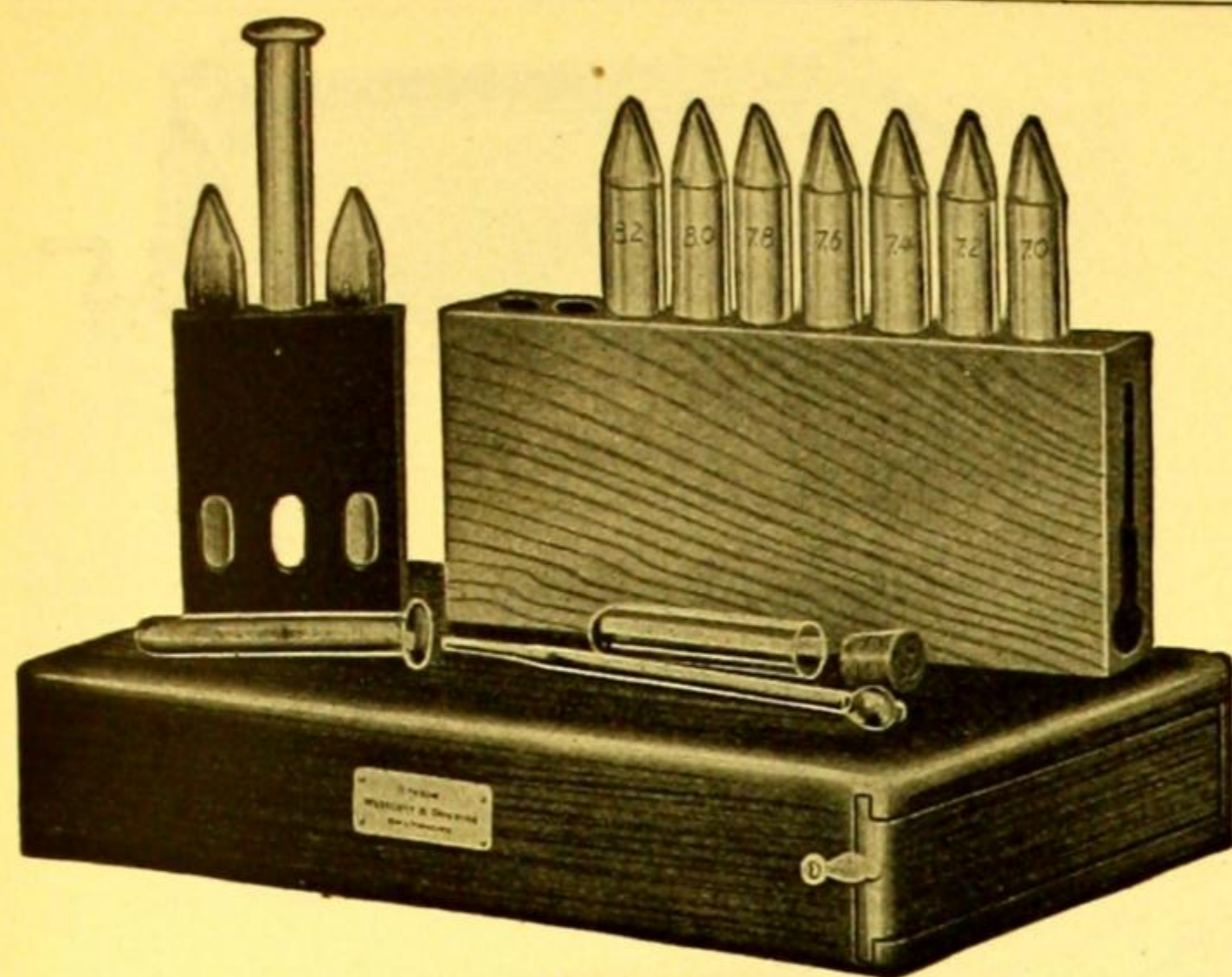
BINS AND CONTAINERS

1208. **BINS or Containers**, made of galvanized iron, air and water-tight, with outside fitting cover; has a heavy steel band top and bottom, the lower one riveted through body and bottom; concave bottom raised $1\frac{1}{4}$ inches from ground; drop handles.
- | | | |
|-------------------------|---------------------------|----------------|
| No. | A | C |
| Size, inches | $14\frac{1}{2} \times 24$ | 19×28 |
| Capacity, gallons | 17 | 32 |
| Each | 5.00 | 8.00 |
1212. **BIN or Container**, of heavy galvanized iron, with handles and cover; will hold half-bushel of soil or grain 2.50
1214. **BIT BRACE**, Plain, malleable iron socket and shell, forged steel jaws, 8-inch sweep..... 2.50
1216. **BIT BRACE**, Ratchet, with ball bearing head. Ratchet design is new and unique; the pawls are strong and positive in action; 8-inch sweep..... 4.40
- F1931. **BLADDER**, prepared and cleaned. For use with bladder glasses to show bursting by atmospheric pressure15

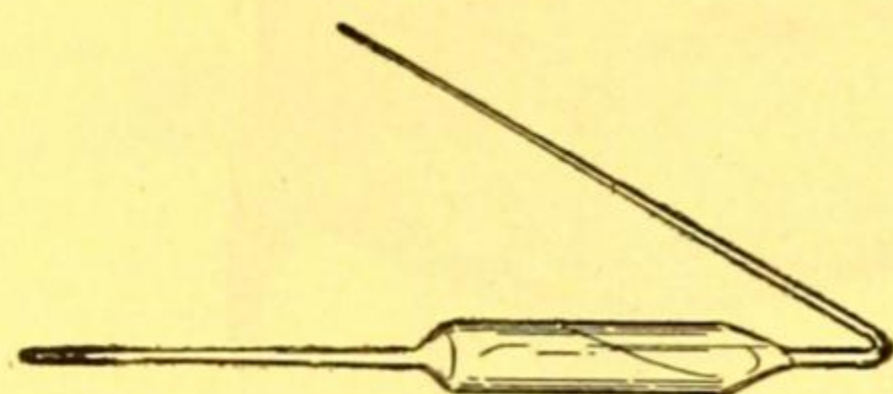


CATALOG F

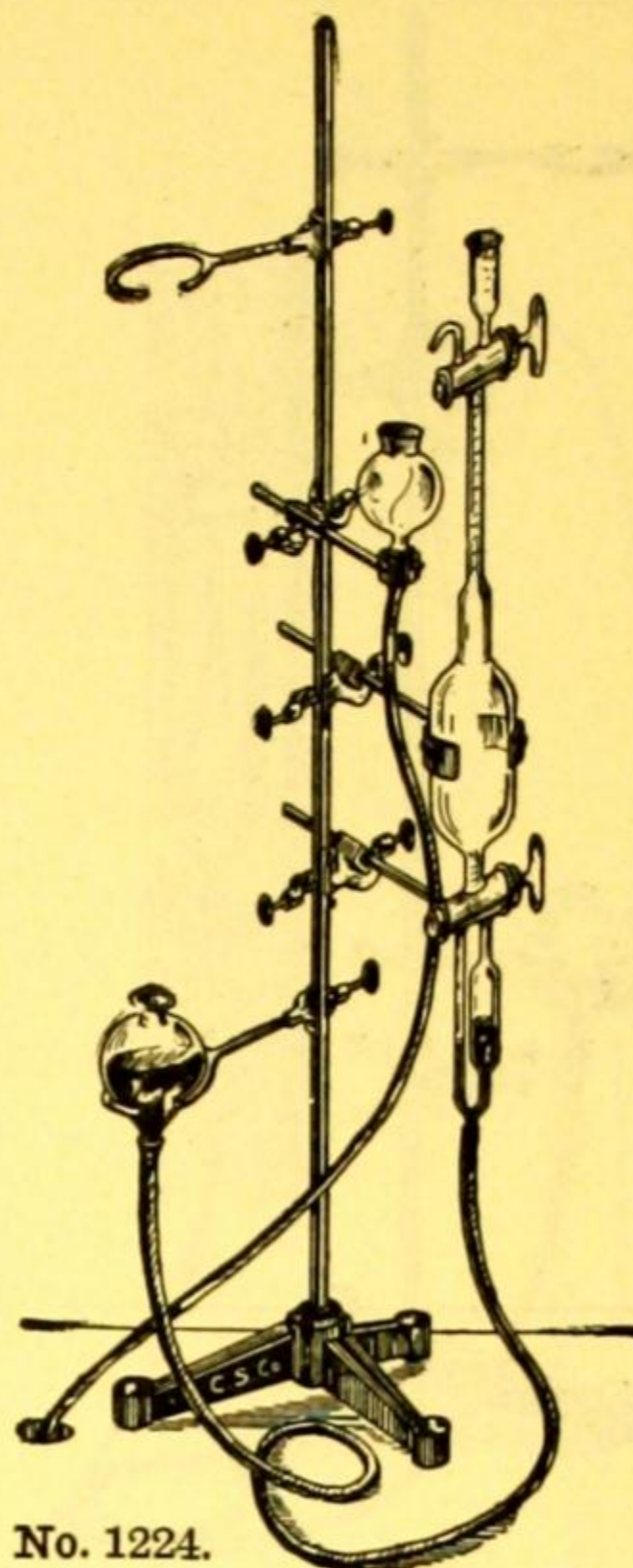
CATALOG F, illustrated here, contains primarily the apparatus for both laboratory and lecture room, used in teaching the subject of Physics in educational institutions. In addition it contains a great many instruments which are used by research workers in all fields of science, such as Mechanical Measuring Instruments, Electrical Apparatus and Optical Instruments. This catalog will be sent postpaid to any teacher or laboratory director immediately upon receipt of a request giving the name of the individual, the institution and his official connection with it.



No. 1220.



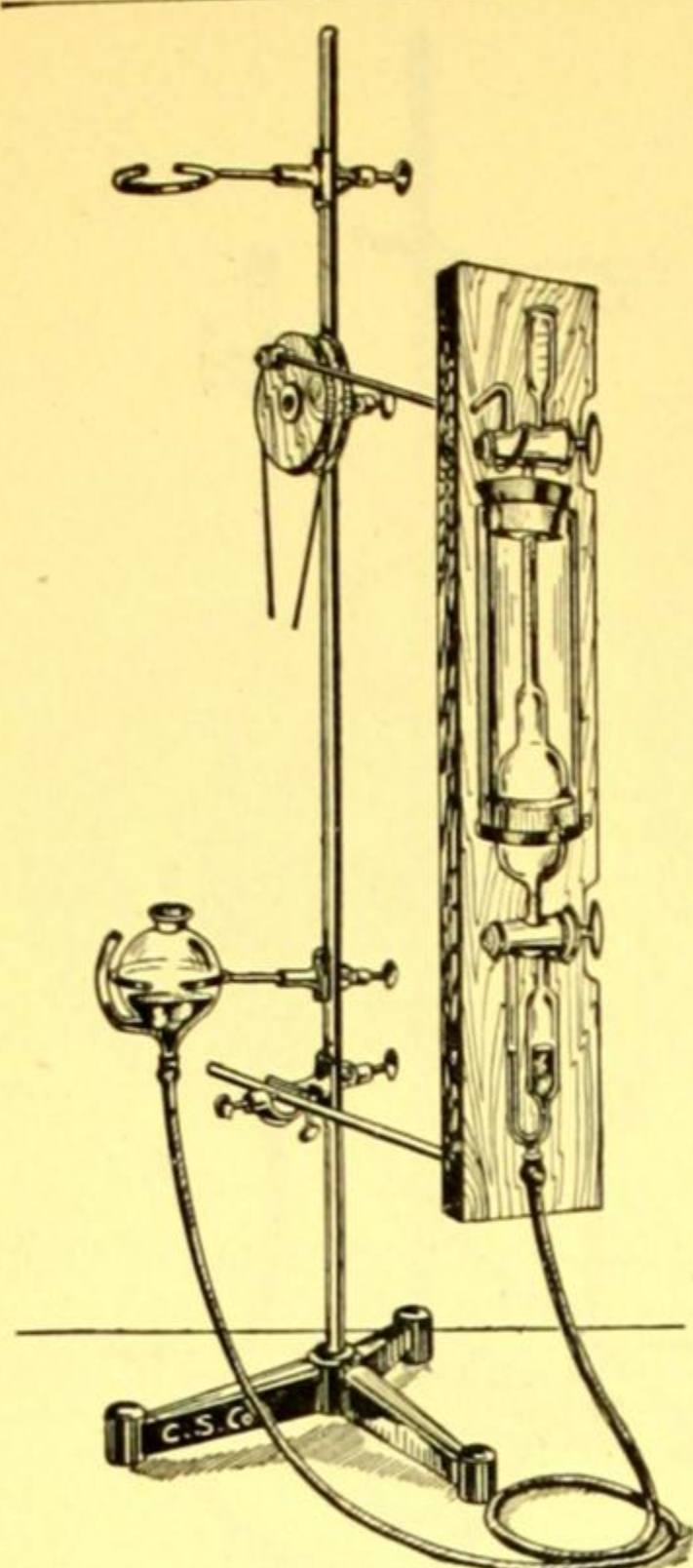
No. 1222.



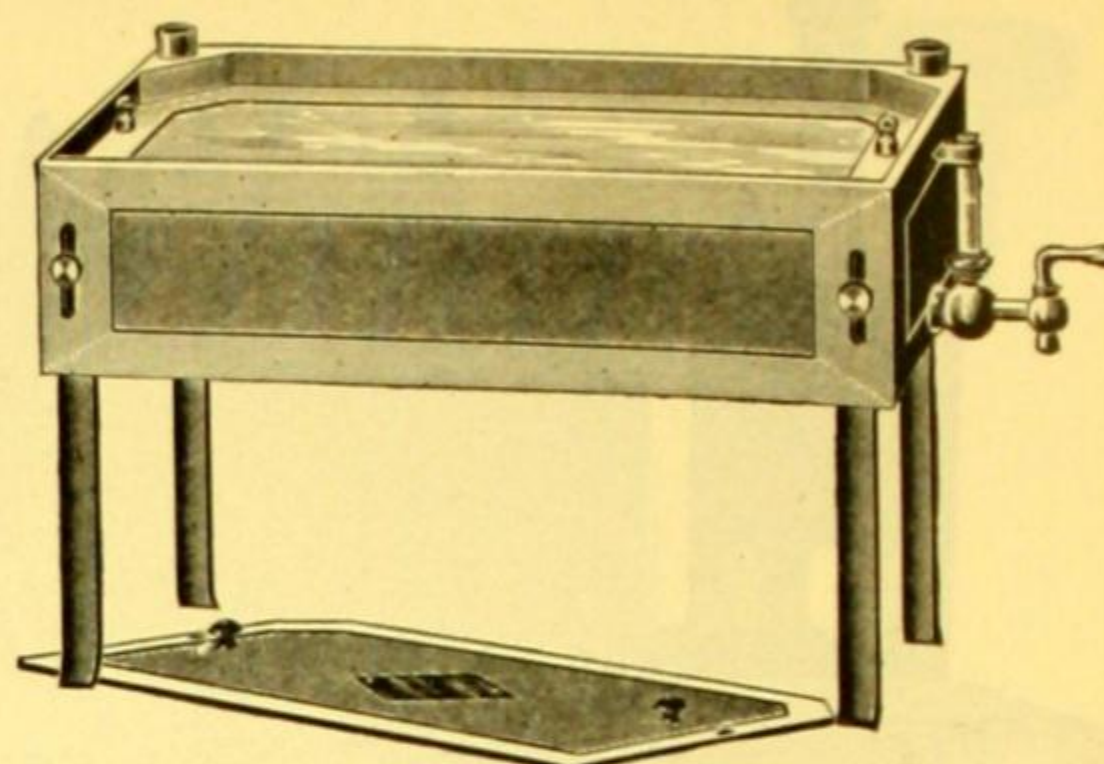
No. 1224.

BLOOD TESTING APPARATUS

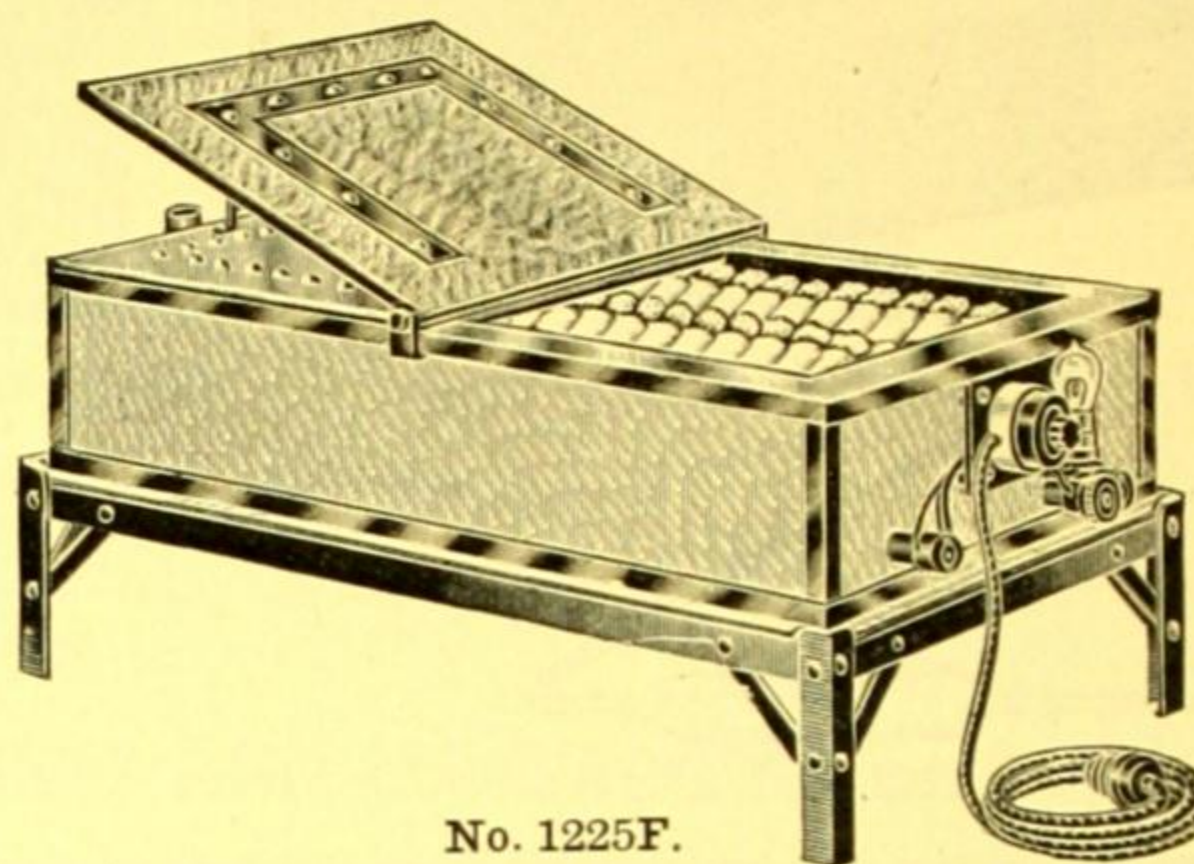
1220. **ALKALI RESERVE DETERMINATION OUTFIT** for blood plasma, consisting of nine sealed tubes of resistance glass containing standardized phosphate solutions colored with phenolsulphonphthalein, numbered from 7.0 to 8.6 by 0.2; one non-soluble dialyzing tube; one tube for making dialyzing sacs; one tube for aeration; one capillary nozzle tube; and 100 cc of phenol-sulphonphthalein in 0.8 per cent. sodium chloride indicator solution. Complete in wooden pocket case with directions for use. (See Archives of Internal Medicine for June, 1916.) \$6.50
- 1220A. **Dialyzing Tubes** only of No. 1220.....per dozen .60
- 1220B. **Glass Tubes** only of No. 1220, for making the dialyzing sacs.....per dozen .72
1221. **ALVEOLAR AIR TESTING OUTFIT**, similar in appearance to No. 1220, but with eight sealed resistance glass tubes filled with standardized phosphate solution colored with penolsulphonphthalein and numbered from 10 to 45 mm by 5 mm. The complete set consists of one long non-soluble glass test tube; one non-soluble glass capillary nozzle; one metallic comparison box to hold the specimen and two color tubes; one 1000 cc rubber bag; one rubber bulb; one pinch-cock; one glass mouthpiece; and 100 cc of standardized sodium bicarbonate indicator solution, in wooden pocket case with directions for use. (See Journal of American Medical Association, Vol. LXVI, pages 1594-1596, for May 20, 1916.)..... 8.50
1222. **Capsules, Wright's**, of glass. For collecting small amounts of blood, which may then be sealed until required for use. Length about 3 inches. Capacity about 2 cc.....per box of 12 1.00
- BASAL METABOLISM APPARATUS**, see page 534.
1224. **BLOOD GAS APPARATUS, Van Slyke**, for the determination of the degree of acidosis from the bicarbonate content of the blood through the liberation and measurement of carbon dioxide from the blood plasma. The apparatus was designed by Dr. Donald D. Van Slyke of the Rockefeller Institute for Medical Research to provide a rapid, accurate method of making this important determination in the clinical laboratory. With this apparatus, a determination requires only a few minutes for completion and may be made with 1 cc or less of blood plasma. The gas volumes are measured in the stem of the special burette, which is graduated to 1 cc by 0.02 cc divisions. Mercury is used as a leveling fluid, about three pounds being required for the satisfactory operation of the apparatus. A 4-ounce glass bottle No. 1578 filled with No. 7128 glass beads, a 250 cc separatory funnel No. 6162 and two pipettes No. 1224C are required in the technique for this determination. These items including mercury are not included in the outfit. Complete with iron stand, clamps, special burette, leveling bulb, rubber tubing, thistle tube and set of directions..... 18.50
- 1224B. **Glass Burette**, only, of No. 1224, with stem graduated to 1 cc by 0.02 divisions making 50 divisions in all. Additional graduations indicate volumes of 1.5, 2.0, 2.5 and 50.0 cc..... 12.00
- 1224C. **Glass Pipette, Ostwald-Van Slyke**, with long tapered delivery tube for use in pipetting from upper cup of No. 1224B. Accurately graduated to deliver 1 cc..... .85



No. 1224F.



No. 1225.



No. 1225F.

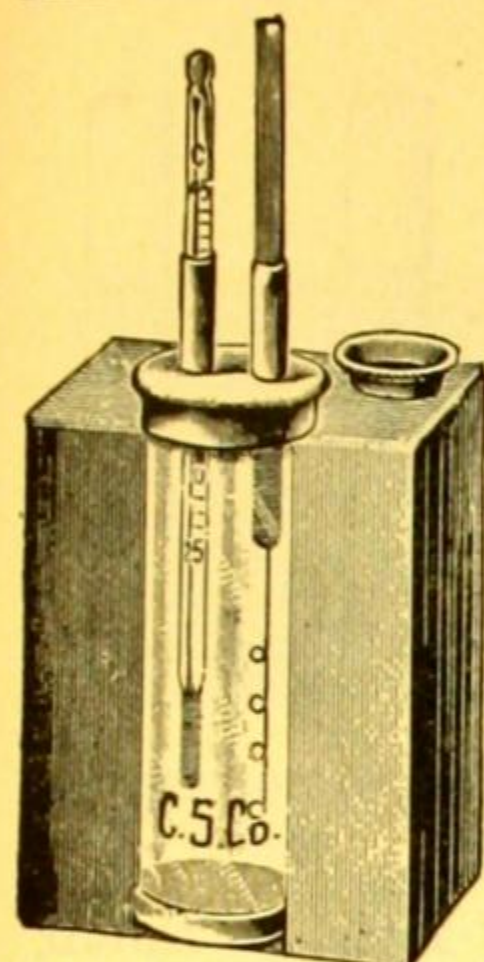
1224F. BLOOD GAS APPARATUS, Van Slyke-Stadie, Precision Model, for the determination of gaseous nitrogen, oxygen, carbon dioxide, carbon monoxide and methemoglobin in blood. The apparatus is a modification of the No. 1224 Van Slyke apparatus for the determination of carbon dioxide in whole blood and blood plasma, with which the authors have developed a technique whereby all the blood gases may be determined in one sample of 1 cc of blood. With this refined apparatus, gas volumes may be read directly to 0.010 cc with an error of less than .005 cc, but in order to preserve this accuracy, the gas chamber is water jacketed. For further accuracy in measuring small gas volumes, a leveling bulb of special construction, which may be used with an index maintained at exactly 500 mm above the surface of the mercury, enables the operator to take readings on gas volumes magnified under a reduced pressure of 500 mm of mercury. The extraction of gas from the blood mixture is facilitated by whirling the mixture about the wall of the chamber by a motor driven shaking device. (See Journal of Biological Chemistry, Vol. XLIX, No. 1, for November, 1921, page 1.) The same accessories as listed under No. 1224 are used with this apparatus but are not included in the outfit. Complete with iron stand, clamps, special burette with water jacket, mounted on a hardwood back with shaking device, special leveling bulb and rubber tubing, but without electric motor..... \$24.00

1224G. Glass Burette and Water Jacket, only of No. 1224F, with stem graduated to 1 cc by 0.01 cc divisions making 100 divisions in all. Additional graduations indicate volumes of 1.5, 2.0, 2.5, and 50 cc..... 16.00

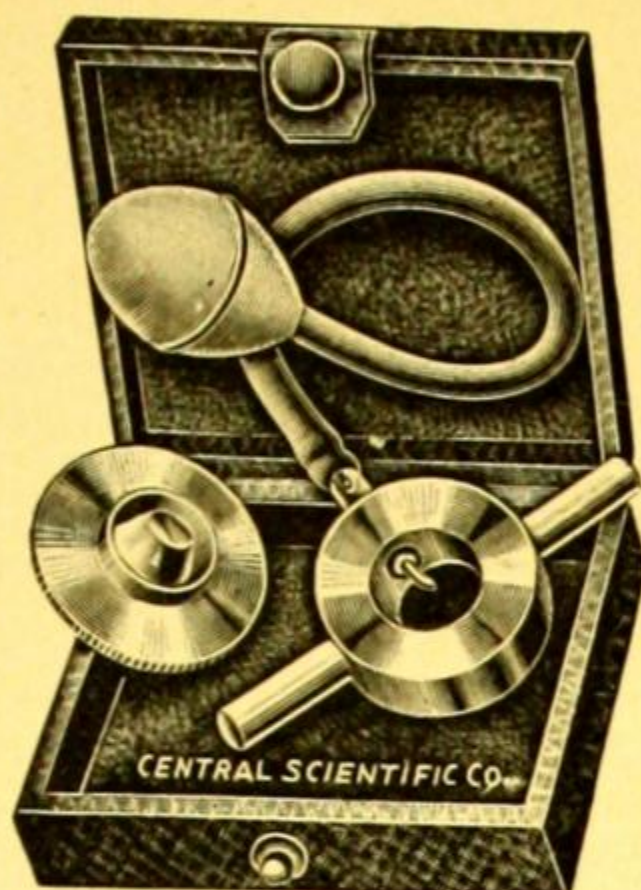
1225. COAGULATORS FOR BLOOD SERUM, Inspissators, double walled, gas heat, for the preparation of blood serum slants employed in diphtheria work. Constructed of copper and heavily tinned on the inside. The outside is covered with insulating material and the top with heavy felt. The two front legs are adjustable in height for tilting to any desired angle to produce the proper slanting surface on the coagulated serum in the test tubes. Complete with water level, drip cock, and tubulatures for thermometer and thermoregulator.

No.	A	C
Length inside, inches.....	12	16
Width inside, inches.....	10	14
Depth inside, inches.....	2½	2½
Each	35.00	45.00

1225F. COAGULATOR FOR BLOOD SERUM, Inspissator, Electric Heat. Constructed with double walls of copper, heavily tinned inside, with bottom and sides covered with asbestos slate to prevent the radiation of heat. The top cover is made of polished copper hinged in the center and covered on the underside with thick felt. A pencil type thermostat connected in parallel with the heating units controls the temperature of the working chamber. A pilot lamp indicates when the current is on or off. Inside dimensions, 22 inches long, 12½ inches wide, by 3½ inches deep. For 110 volts A. C. or D. C. Complete on 4 inch iron stand with two adjustable racks for 18 tubes..... 120.00



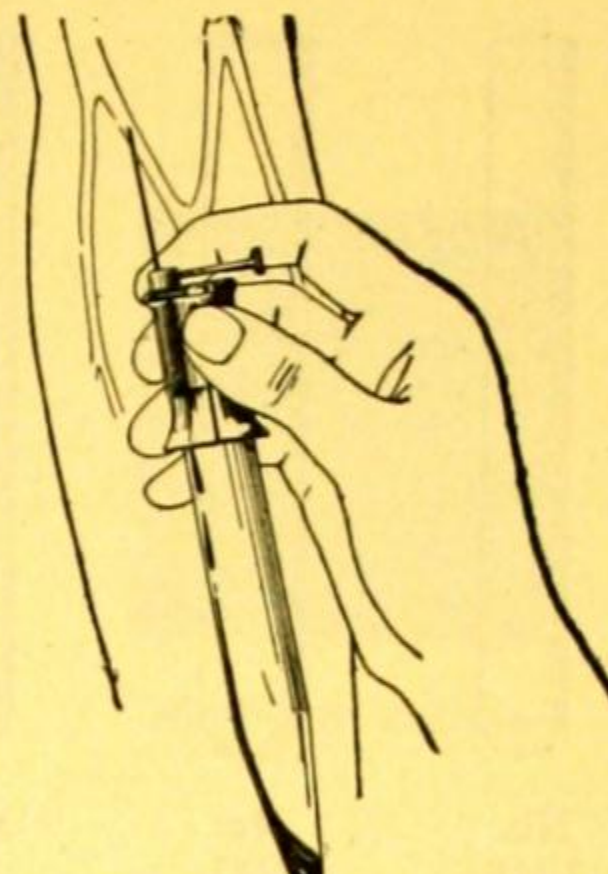
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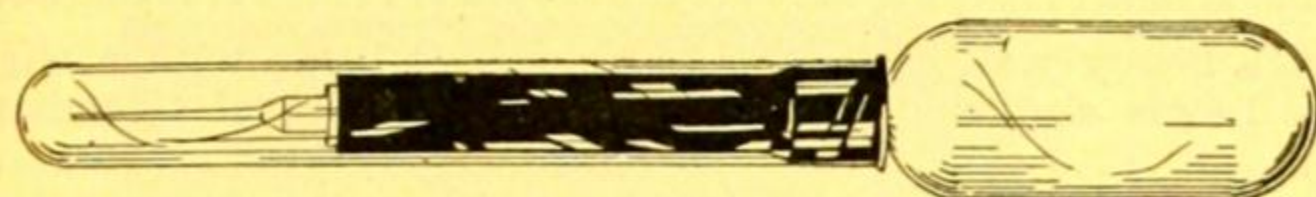
No. 1228.



No. 1232.



No. 1233.



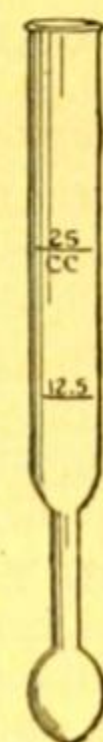
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No. 1236.



No. 1237.

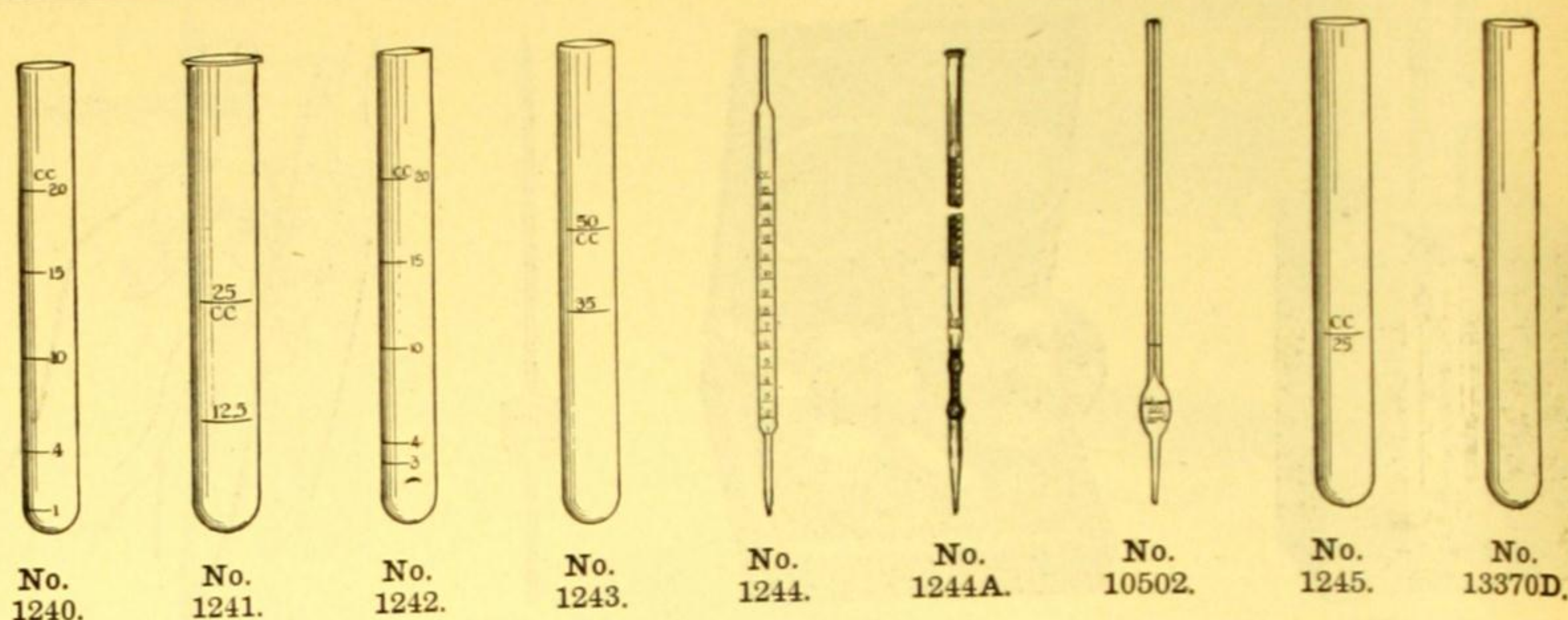


No. 1238.



No. 1239.

1226. **COAGULOMETER, Biffi-Brooks**, for the coagulation test of blood. Requires but a few moments for the determination, is accurate and readily portable. With thermometer and directions for use \$13.00
1228. **COAGULOMETER, Brodie-Russell-Boggs**, for use on the microscope stage for determining the exact time for coagulation of blood from the movement of the blood corpuscles when subjected to blasts of air from the rubber bulb. Complete with rubber bulb, in velvet lined leather case 15.00
1232. **COLLECTING NEEDLES, Wassermann**, for obtaining blood for investigation. With knurled finger grip to facilitate insertion..... each .12
per dozen 1.20
1233. **COLLECTING NEEDLE, Wassermann, Detroit Clinical Type**, for use with standard 15 cc centrifuge tubes. By means of this device the blood may be collected directly in the centrifuge tube thus obviating the possibility of contamination thru transferring of the sample from one vessel to another. Of brass, nickel-plated, with constriction and slotted edge causing it to fit firmly over lip of centrifuge tube. Complete with two steel needles of proper size.... 1.00
- 1233A. **Needles only**, for No. 1233..... each .10
per dozen 1.00
1234. **COLLECTING TUBES, Keidel's Vacuum**, consisting of a 5 cc bulb, drawn out to a capillary tip and sealed after a vacuum has been created by heating, a 25 gage hose-hub needle, a piece of rubber tubing for connecting needle and bulb and a glass tube for protection during sterilization. Complete as illustrated..... each .20
per dozen 1.80
- COLORIMETERS for Blood Testing**, see general heading **Colorimeters**.
1236. **CULTURE TUBE, Keidel Vacuum, for Blood**, modified by Judd and Simon for culture work. Consists of a tube with a capacity of 50 cc drawn out to a capillary tip, into which is introduced 15 to 25 cc of glucose bouillon containing 1.5 cc of sodium citrate. The tube is then exhausted and sealed. Complete with a 24 gage hose-hub needle with stylet, heavy walled rubber connecting tubing, and a glass tube for protection during sterilization, filled and sealed ready for use..... each .60
per dozen 6.00
1237. **BLOOD SUGAR TUBE, Folin**, improved form, with 4 cc bulb, parallel constriction and slight lip. Graduated at 25 cc. This tube is also used for the determination of creatinine plus creatinine. (See Folin and Wu: Journal of Biological Chemistry, 1920, xli, 367.)..... .55
1238. **BLOOD SUGAR TUBE, Folin**, same as No. 1237, but graduated at 12.5 and 25 cc..... .60
1239. **BLOOD SUGAR TUBE, Folin**, same as No. 1237, but without graduation mark, to be calibrated in the laboratory..... .40

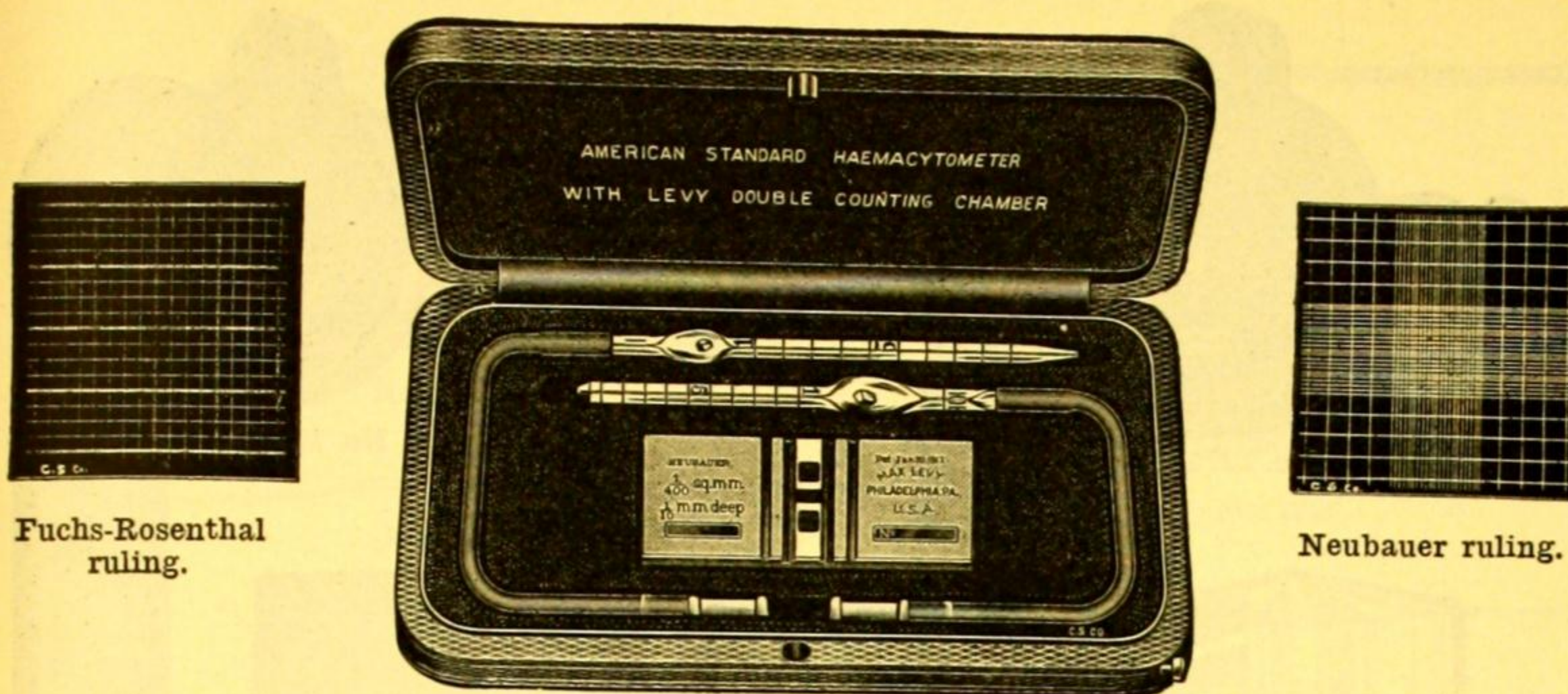


1240. **BLOOD SUGAR TUBE**, Gradwohl-Blaivas, a heavy wall test tube 150 mm by 18 mm without lip, graduated at 1, 4, 10, 15 and 20 cc. (See Gradwohl and Blaivas: Newer Methods of Blood and Urine Chemistry, 1920, page 28)..... \$0.50
1241. **BLOOD SUGAR TUBE**, Lewis-Benedict, a heavy wall test tube 160 mm by 25 mm with a slight lip, graduated at 12.5 and 25 cc. (See Lewis and Benedict: Journal of Biological Chemistry, 1915, xx, 61.)..... .50
1242. **BLOOD SUGAR TUBE**, Myers-Bailey, a heavy wall test tube 200 mm by 13 mm inside diameter, without lip, graduated at 3, 4, 10, 15 and 20 cc. (See Myers and Bailey: Journal of Biological Chemistry, 1916, xxiv, 147, and Victor C. Meyers: Practical Chemical Analysis of Blood, 1921, page 67.)..... .50
1243. **DIGESTION TUBE**, Folin, a heavy Pyrex Glass test tube 200 mm by 25 mm graduated at 35 and 50 cc, for use in the Micro-Kjeldahl digestion of blood filtrates in the determination of non-protein nitrogen in the blood. It is also used in the determination of urea in blood by means of urease and autoclave decomposition. The graduation facilitates nesslerization in the digestion tube. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 87.).. .70
- 13370D. **DIGESTION TUBE**, Folin, same as No. 1243, but without graduation for calibration in the laboratory per dozen 4.08
For special apparatus for **FOLIN MICRO-KJELDAHL METHODS**, see general heading **Urine Analysis**.
1244. **PIPETTE**, Folin-Wu, for use in the preparation of protein free blood filtrates. Graduated from tip to 15 cc by 1 cc divisions. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 81.)50
- 1244A. **BURETTE**, Folin Micro-Sugar, for pinch-cock connection with special tip for the delivery of 45 to 55 drops per cc. Graduated to 5 cc by .02 cc divisions. Length, 14 inches. Complete with rubber connection and tip..... 2.25
10502. **PIPETTES**, Ostwald-Folin, as used in Folin's method for the determination of total nitrogen, urea and ammonia in urine, and in the methods of various biochemists for other determinations upon body fluids. The capacity indicated is the volume **delivered** when the pipette is entirely emptied. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 81.)
Capacity to deliver, cc..... 1 2 3 5
Each55 .58 .67 .70
1245. **RECEIVING TUBE**, Folin, a heavy wall test tube without lip with graduation at 25 cc. Used in the determination of urea by urease decomposition and the Micro-Kjeldahl method. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 87.)..... .30

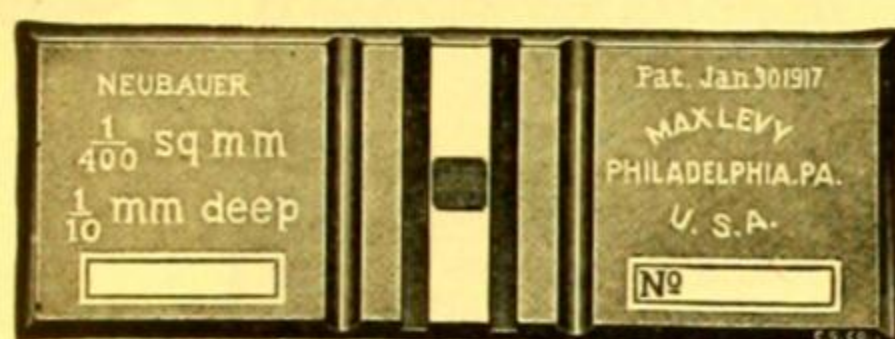
We Carry a Complete Stock of

Cenco Certified Chemicals Colemann and Bell Stains
Difco Desiccated Culture Media
Pfanstiehl Rare Sugars and Pfanstiehl Amino Acids

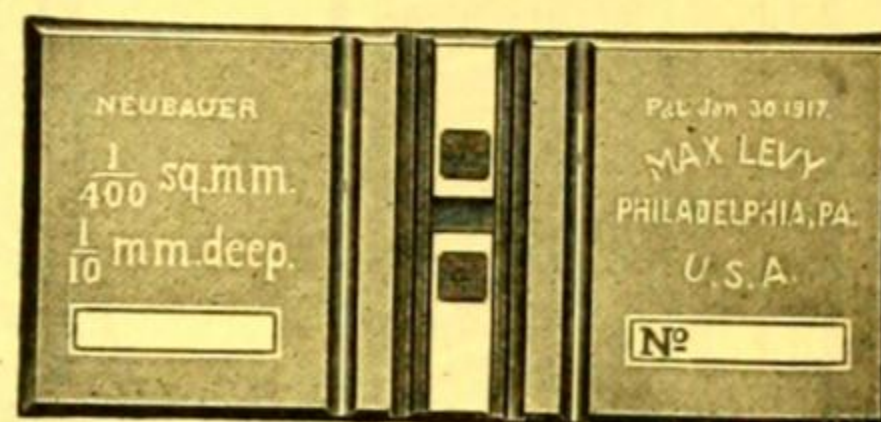
Send for Our Chemical and Reagent Catalog



No. 1250.



No. 1249.

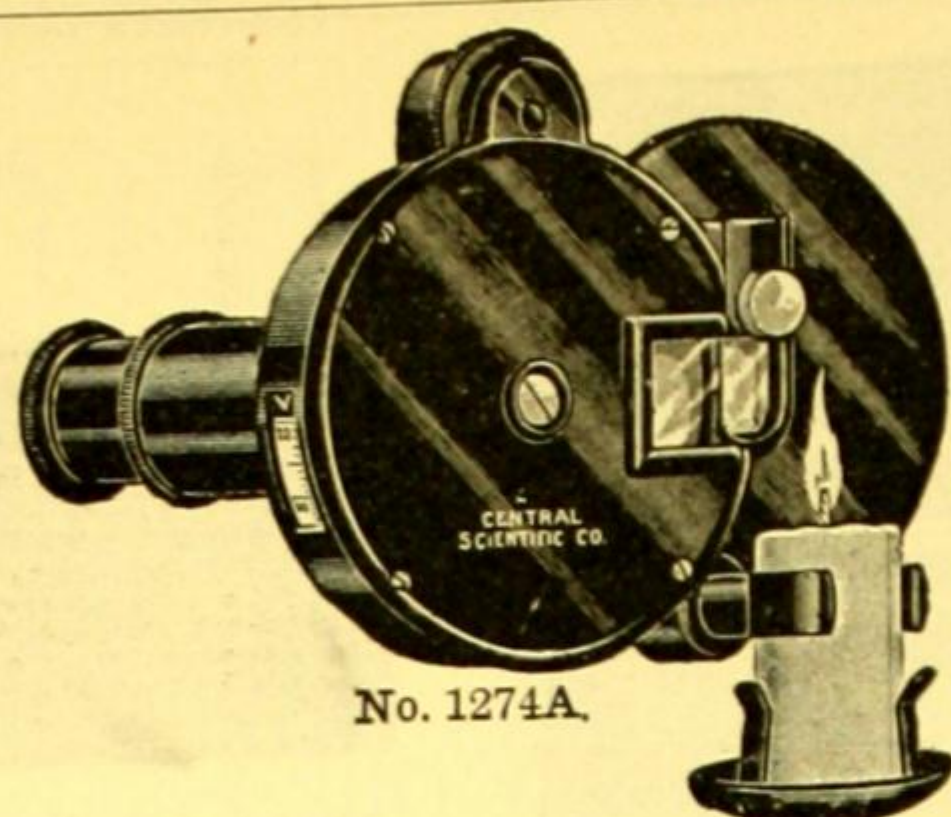


No. 1251.

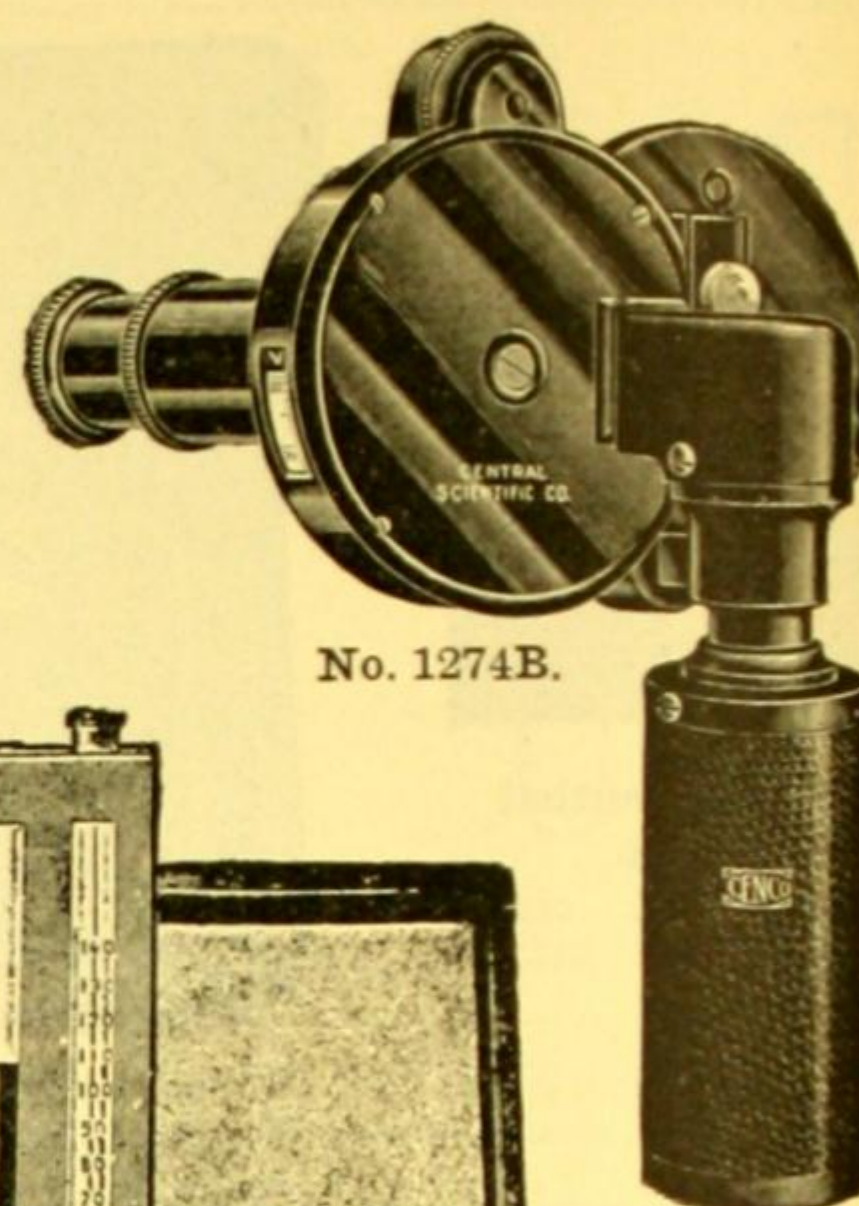
HAEMACYTOMETERS

Considerable time and experiment has been devoted to the development of blood counting apparatus, which would be of the required degree of accuracy and at the same time of maximum utility. Bürker, dissatisfied with the older form of blood counters with the closed circular moat, first suggested the open form of chamber with parallel moats. He later proved that, when properly filled, the open form provides a more uniform distribution of corpuscles than is possible with the circular, closed form of chamber, and further showed that the depth of the film of solution under the cover glass is unaffected by changes in atmospheric pressure. All of the Haemacytometers and counting chambers which we list are of the Bürker type.

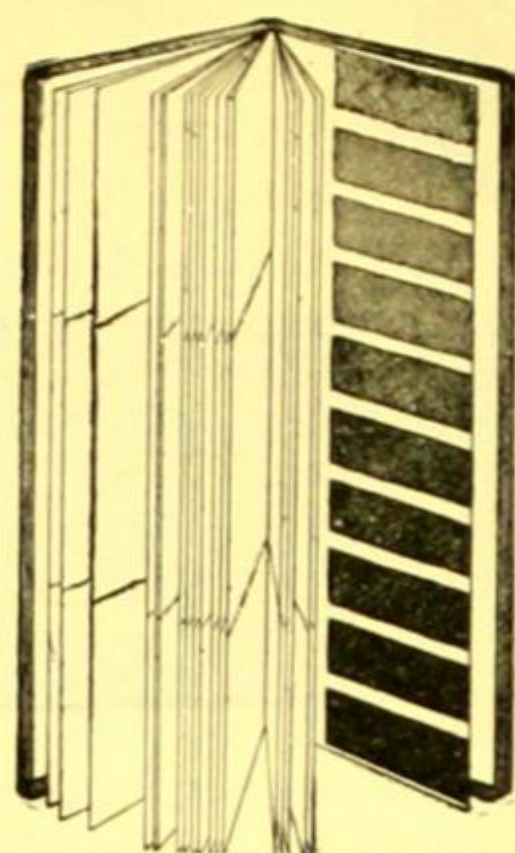
1246. **LYMPHOCYTE COUNTING APPARATUS**, with Fuchs-Rosenthal ruling. A modified haemacytometer for cytological investigations of the cerebro-spinal fluid, with open form of chamber 0.2 mm deep instead of the usual 0.1 mm required for blood counts. Complete with counting chamber, two cover glasses and one diluting pipette, in leather case..... \$11.50
1247. **Counting Chamber**, only, of No. 1246, with two cover glasses; without case..... 6.00
1248. **HAEMACYTOMETER**, with Single Neubauer Ruling. The chamber is ruled to 1/400 mm with the Neubauer arrangement of lines and is 1/10 mm deep. Complete with one single Neubauer chamber, two cover glasses, one diluting pipette for red and one for white corpuscles, in leather case..... 15.00
1249. **Counting Chamber**, only, of No. 1248, with two cover glasses; without case..... 7.00
1250. **HAEMACYTOMETER**, Levy, with Double Neubauer Ruling. The chamber furnished with this haemacytometer is of the same construction as that of No. 1248, except that it is provided with two Neubauer rulings separated by a short moat. The double chamber enables both red and white corpuscles to be counted at the same time without cleaning and refilling the chamber. The unusual rapidity with which it is possible to make blood counts with this haemacytometer has made it the universal favorite of the medical profession. Complete with one double Neubauer chamber, two cover glasses, one diluting pipette for red and one for white corpuscles, in leather case..... 18.00
1251. **Counting Chamber**, only, of No. 1250, with two cover glasses; without case..... 10.00
1252. **Cover Glasses**, only, for No. 1250, size 20 by 26 by 0.5 mm..... each .50
1253. **HAEMACYTOMETER**, Levy, Bürker-Neubauer, same as No. 1250, but with Bureau of Standards certificate for counting chamber and pipettes 26.00
1258. **HAEMACYTOMETER**, with Türk ruling. Same as No. 1248 but with the arrangement of the lines in the ruling according to Türk. Complete with one single Türk chamber, two cover glasses, one diluting pipette for red and one for white corpuscles, in leather case..... 13.75
1259. **Counting Chamber**, only, of No. 1258, with two cover glasses; without case..... 7.00
1266. **MIXING PIPETTE**, Thoma, for red corpuscles, for dilution in the ratio of 1 to 100, with rubber tubing and mouthpiece..... 2.00
1267. **MIXING PIPETTE**, Thoma, for white corpuscles, for dilution in the ratio of 1 to 10, with rubber tubing and mouthpiece..... 2.00
1270. **COVER GLASS** for Counting Chamber, 21 mm square, polished, 0.4 mm thick..... .50
1272. **CASE** for Counting Chamber, of leather, velvet lined 1.50
1273. **CASE** for Complete Haemacytometer, of leather, velvet lined..... 3.00



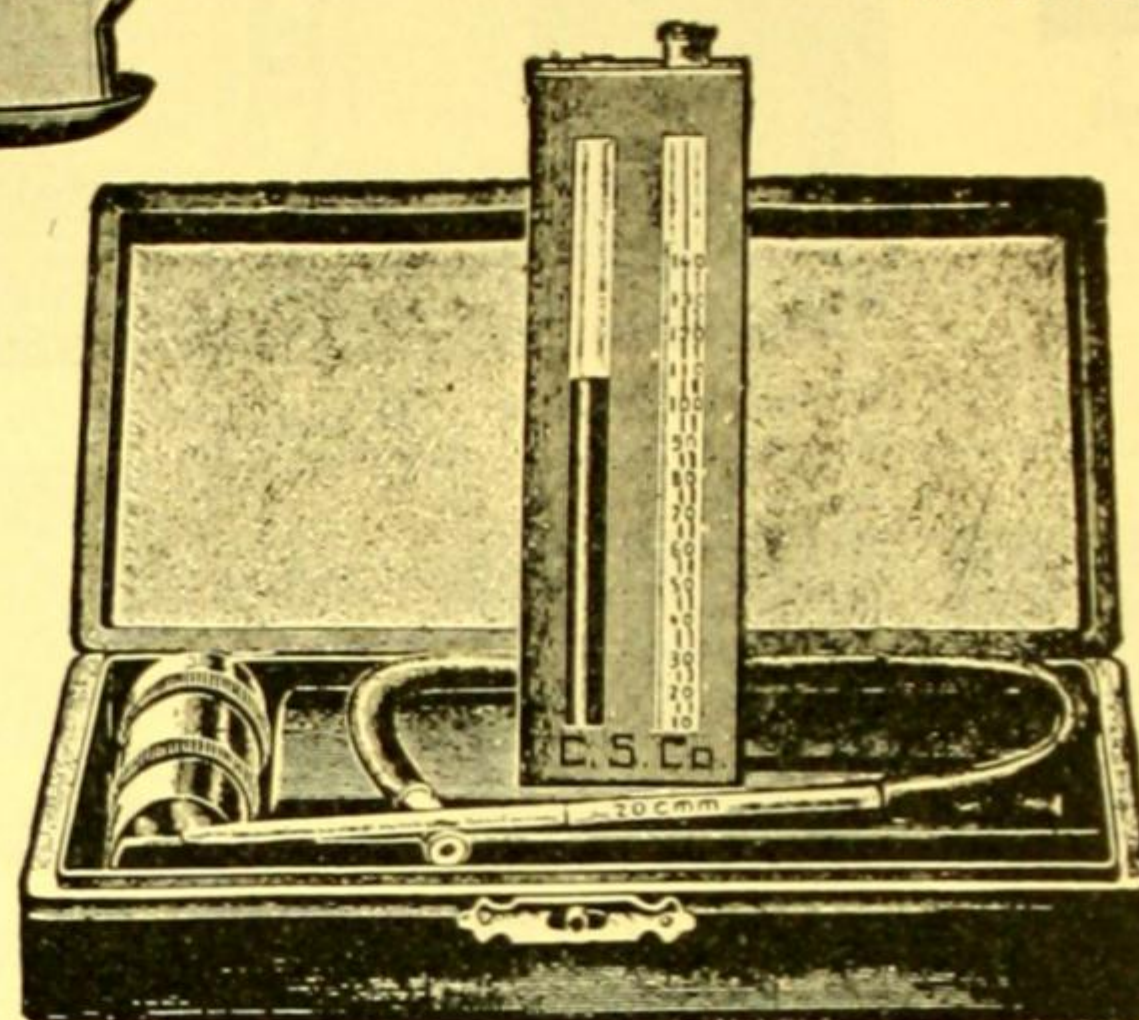
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No. 1274B.



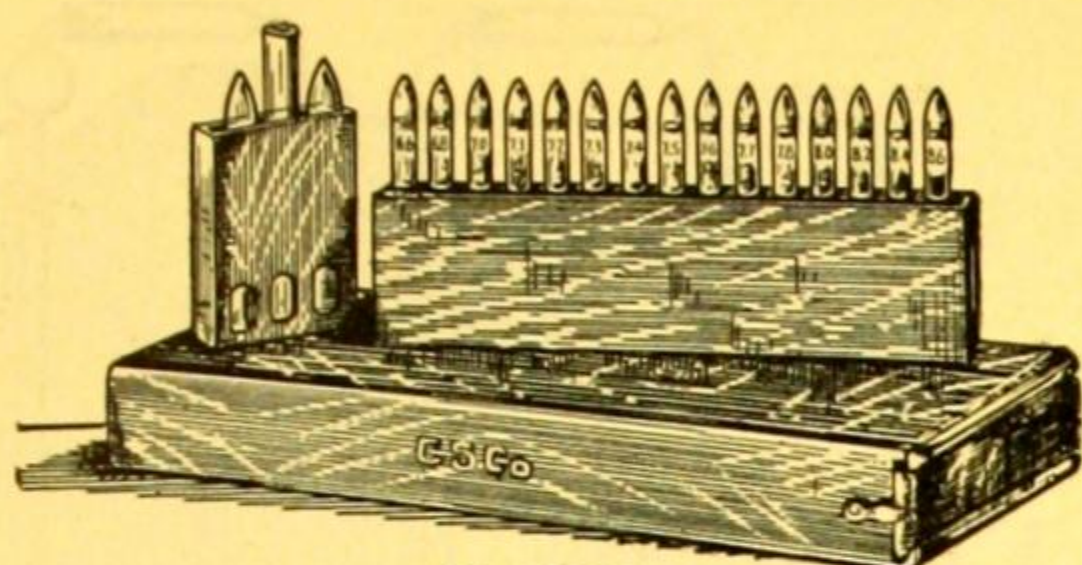
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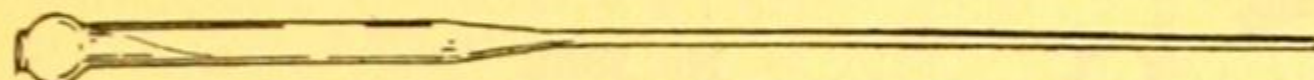
No. 1280.

1274. **HAEMOGLOBINOMETER, Dare**, for giving an expression of the extent of anemia in terms of percentages of haemoglobin in normal blood, 100 per cent. corresponding to the color of a solution of 13.77 grams of haemoglobin in 100 cc of serum. The various shades of color corresponding to the scale are obtained by rotation of a prismatic glass semicircle tinted with the golden purple of Cassius, which is secured to a thin white glass disk. The numerical scale is placed on the edge of a corresponding semicircle of thick opal glass and is read through a window in the side of the instrument. A feature of this instrument is the automatic pipette for collecting the blood sample, which consists of an oblong plate of opal glass and one of clear glass, ground so as to leave a small space between the two when clamped together. A small drop of blood touched to the edge of the pipette will be instantly drawn in and distributed evenly by capillary attraction. The case protecting the working parts of the instrument and the viewing telescope are of aluminum lacquered black. The instrument is supplied in two models, one for candle illumination and the other for electric illumination using a small battery concealed in the handle as a source of current. A velvet lined leather carrying case is supplied with each instrument.

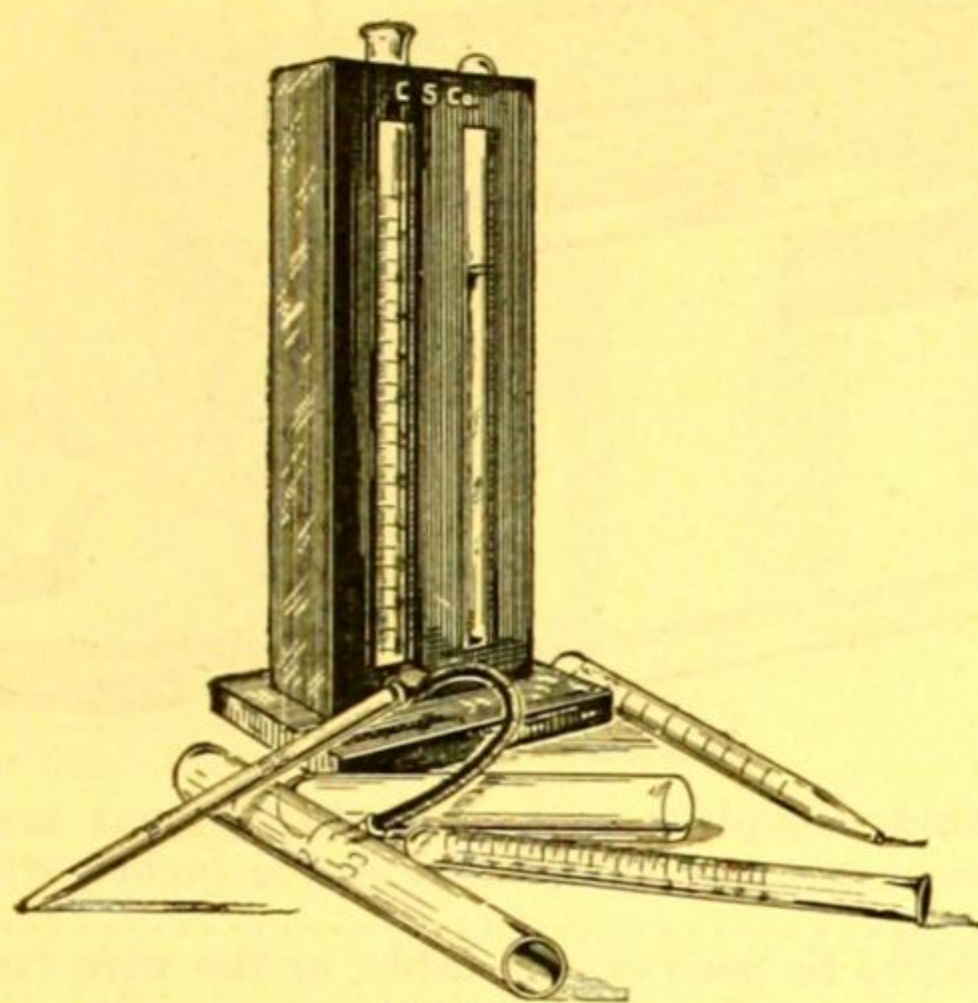
No.	A	B
Illumination	Candle	Battery
Each	\$30.00	39.00
1275A. Lamp, Incandescent, for replacement in No. 1274B instrument.	each	.50
1275B. Battery, for replacement in No. 1274B. About 250 blood examinations can be made with each battery	each	.35
1276. Pipettes, Automatic Collecting , consisting of one oblong opal glass plate and one clear glass plate of the proper dimensions for correctly collecting and holding the blood samples in No. 1274 Haemoglobinometers.		
No.	A	B
Illumination	Candle	Battery
Each	\$30.00	39.00
1278. HAEMOGLOBINOMETER, Tallquist , consisting of a color scale of 10 tints, ranging from 10 per cent. to 100 per cent., bound in book form, pocket size, with 50 sheets of absorbent paper sufficient for 150 tests. With directions for use		1.75
1280. HAEMOMETER, Sahli , for determining the haemoglobin content of blood by converting the haemoglobin to haematin hydrochloride and comparing with a liquid color standard sealed in a glass tube, corresponding to a 1 per cent. solution of normal blood. The graduated tube has 140 divisions each corresponding to 20 emm. Twenty emm of blood and 200 emm of one-tenth normal hydrochloric acid are placed in it and diluted with water until the two tubes have the same color. As the color standards change with age, they must be frequently checked. Complete with tested liquid color standard, pipette, hard rubber stand for tubes, hard rubber blood container with vial and rubber stopper in leather case with directions for use..		8.00



No. 1286.



No. 1322.



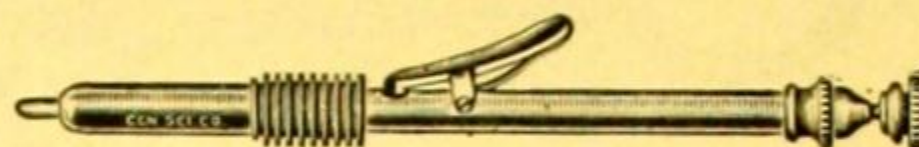
No. 1308.



No. 1290.



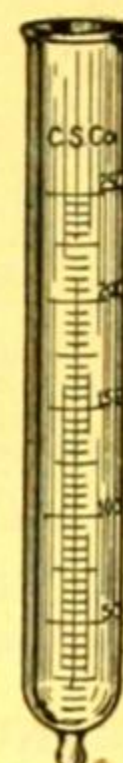
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No. 1296.

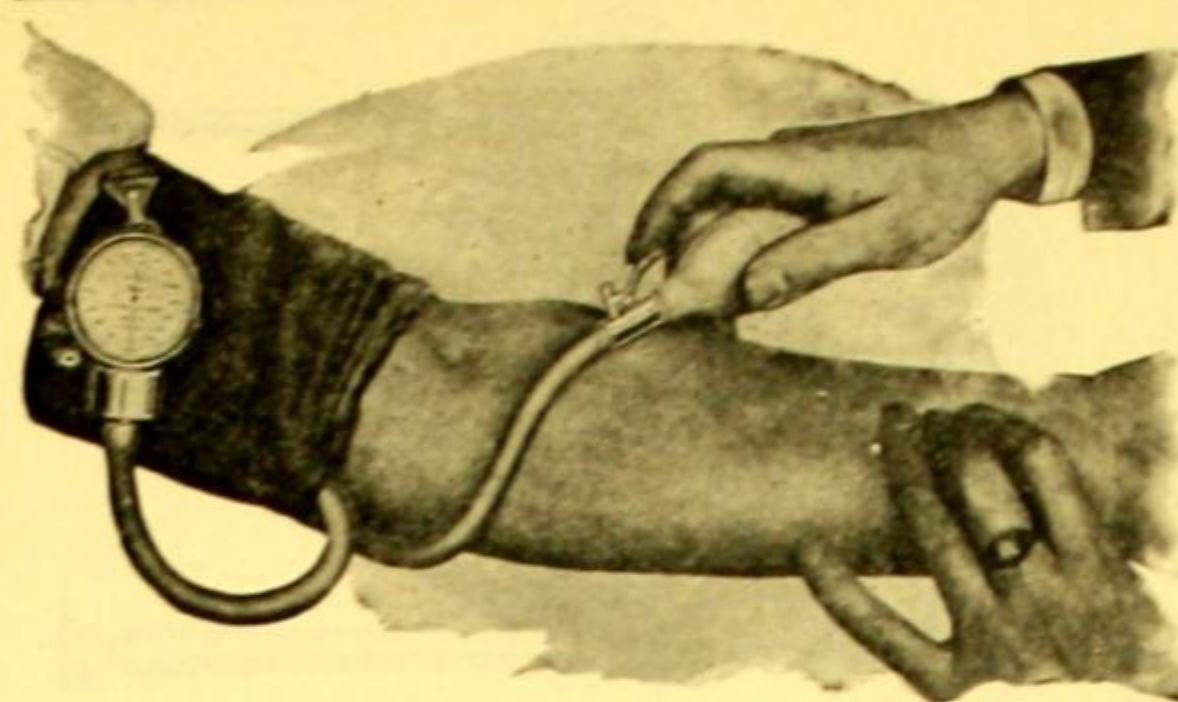


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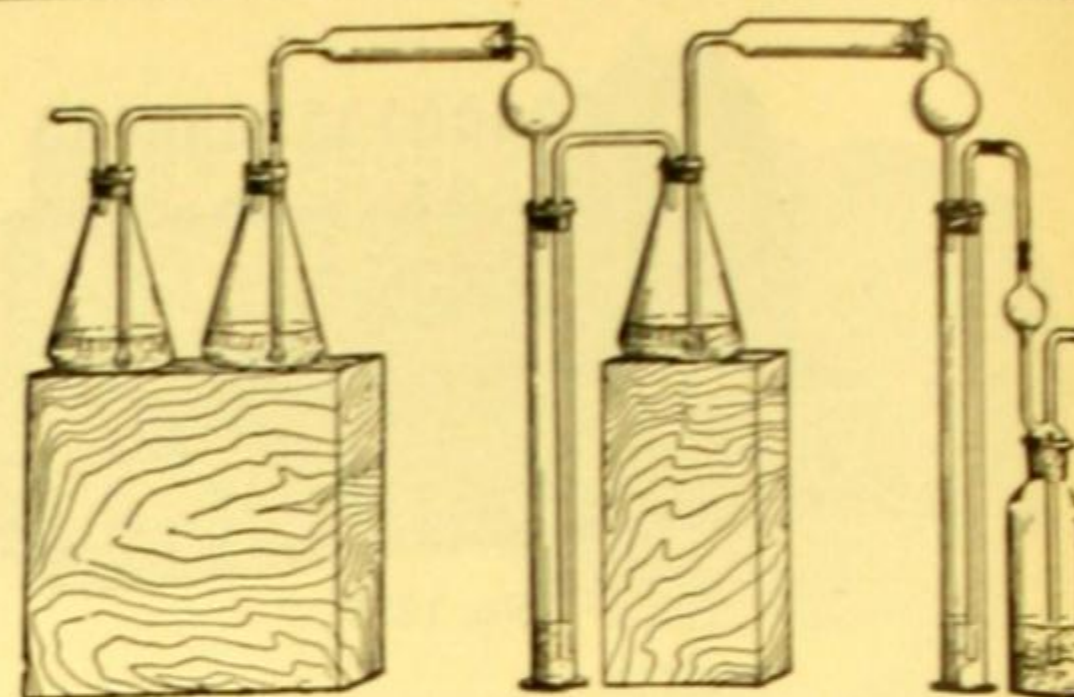


No. 1340.

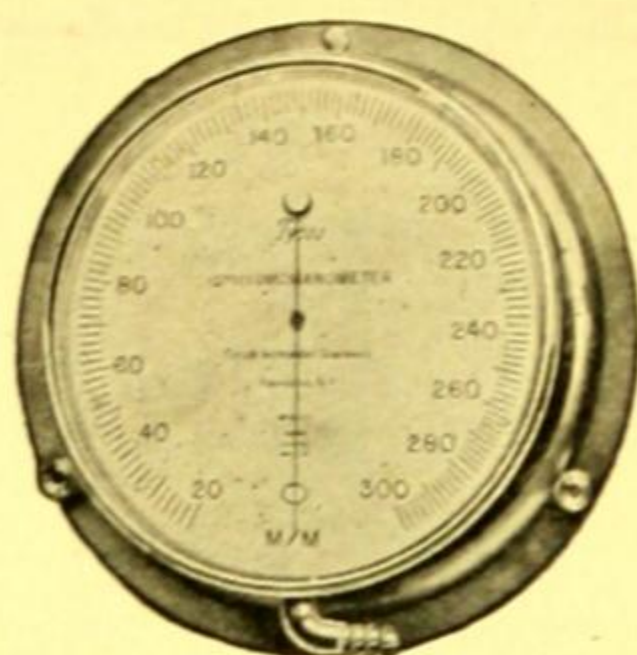
1281. **Haemoglobin Standard**, in sealed glass tube, for use in No. 1280..... \$2.00
1282. **Graduated Tube**, 140 divisions, for No. 1280..... 1.35
1283. **Graduated Pipette**, 20 cmm, for No. 1280..... 1.35
1286. **HYDROGEN-ION CONCENTRATION APPARATUS** for determining the hydrogen-ion content of the blood colorimetrically, as suggested by Drs. Levy, Rountree and Marriott. The outfit consists of a series of standard colored liquids sealed in glass tubes, a wooden holder for the tubes and a comparison box for matching the color of the unknown with the standard colors. Complete in wooden case $1\frac{3}{8} \times 4 \times 11\frac{1}{2}$ inches. (See Archives of Internal Medicine, Vol. XVI, for September 1915, page 389.)..... 8.50
- For other **HYDROGEN ION CONCENTRATION APPARATUS**, see No. 10312.
1290. **LANCET, Blood**, with nickel-plated metal handle into which the lancet can be screwed for protection..... .80
1292. **LANCET, Blood**, same as No. 1290, but with hard rubber handle..... .55
1296. **LANCET, Blood, Spring**, in nickel-plated handle with spring clamp, and screw to adjust depth..... 2.50
- METABOLISM APPARATUS**, see page 533.
- MICROSCOPES** for Blood Testing, see general heading **Microscopes**.
1308. **MICRO-SACCHARIMETER, Epstein's**, for the estimation of sugar in the blood, making use of the color change brought about by heating a mixture of sugar and picric acid in the presence of sodium carbonate, the depth of the color depending on the amount of sugar present. With this apparatus an accurate determination may be made with as small an amount as 0.1 cc of blood. Complete with two standard color tubes, an accurately graduated tube for the unknown, holder with opaque glass slide for the color tubes, pipette graduated to 1 cc in 0.1 cc divisions, capillary pipette graduated at 0.1 and 0.2 cc, tube graduated at 1 and 2.5 cc, two boiling tubes with holder, filtering funnel, dropper, and set of three solutions—picric acid, sodium carbonate, and sodium fluoride, in case with directions for use..... 14.00
1320. **PIPETTE, Comer Automatic**, for vaccines, etc., designed to deliver exactly 1 cc, with reservoir to hold excess..... 1.30
- PIPETTES, Wassermann**, see No. 10506.
1322. **PIPETTE, Wright's Blood**, of soft glass with end shaped to take rubber tube, and with point carefully drawn to capillary tip. Length over all, $7\frac{1}{2}$ inches..... .20
- REFRACTOMETERS** for Albumin in Blood, see general heading **Refractometers**.
1340. **SALVARSAN TUBE, Graduated**, with rubber tubing connections at the bottom. Diameter, $1\frac{5}{8}$ inches; length, 12 inches; capacity, 250 cc..... 1.50
- SPECTROSCOPES** for Blood, see general heading **Spectroscopes**.



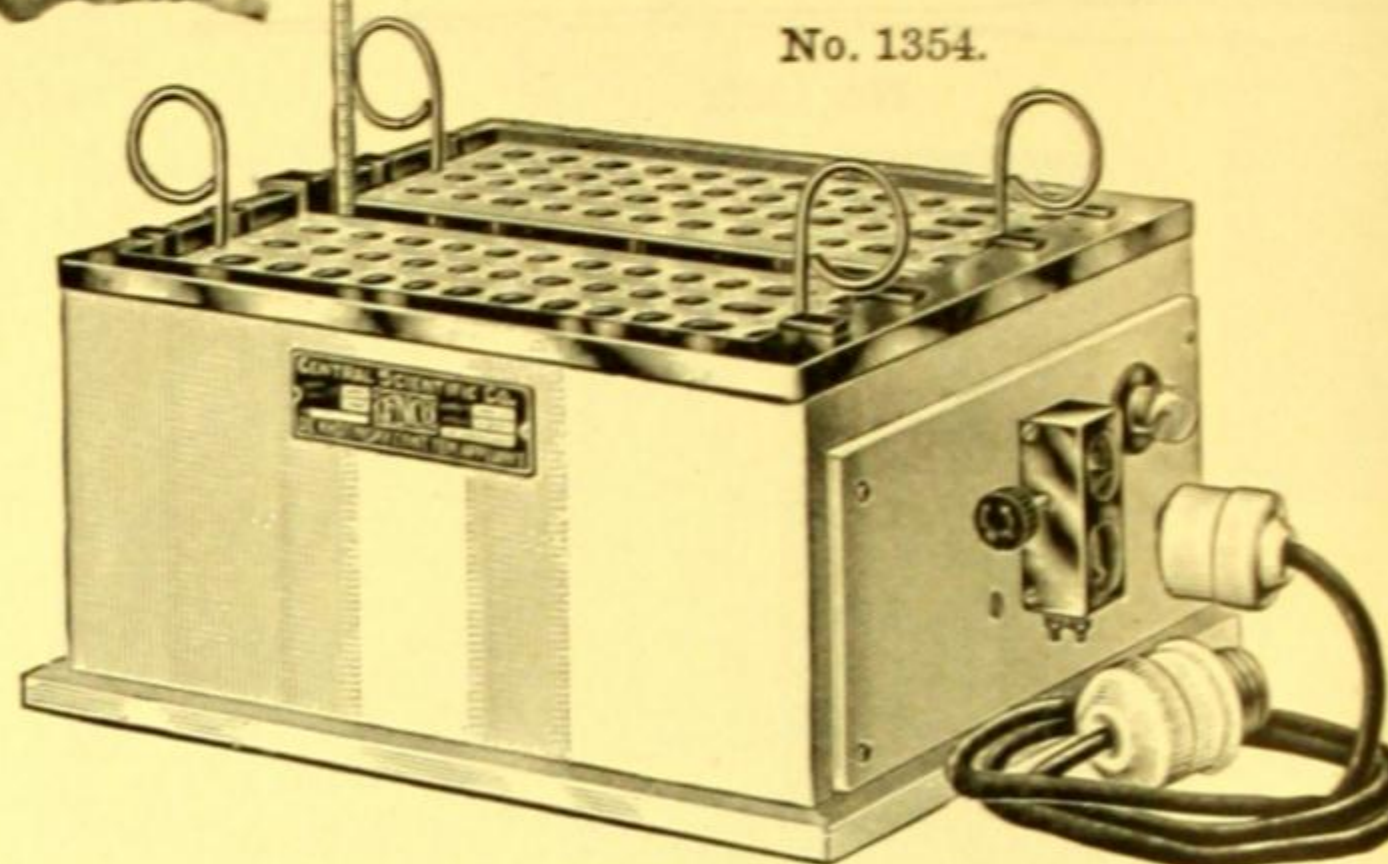
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No. 1354.

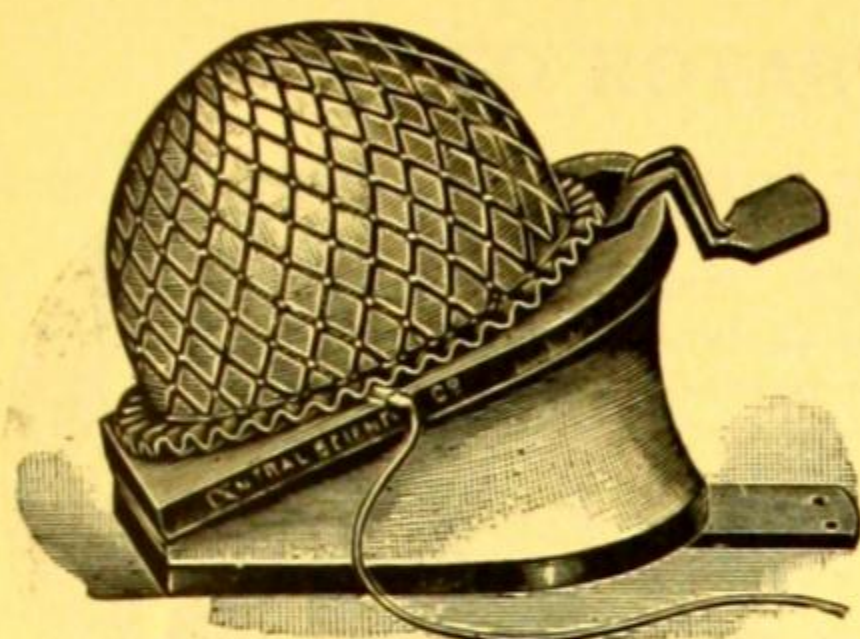


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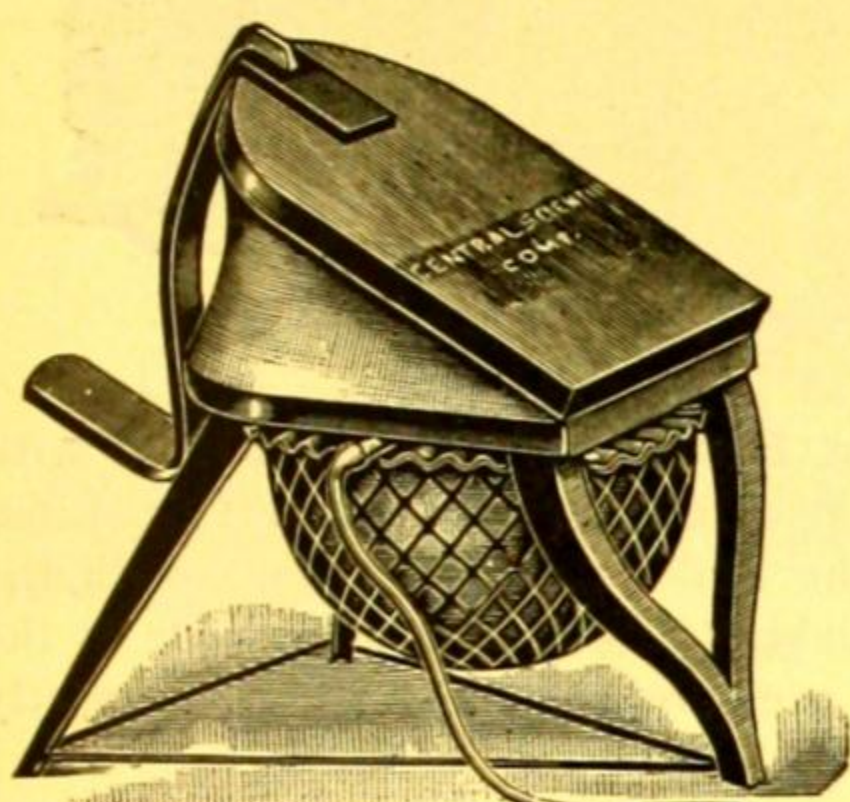


No. 14336B.

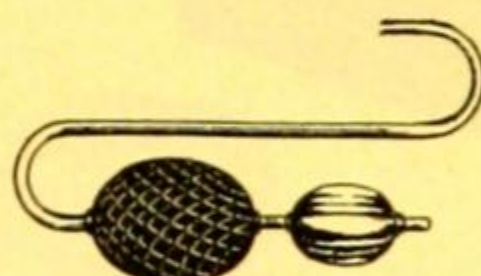
1346. **SPHYGMOMANOMETER**, Roger's Tycos Aneroid, complete with indicator, patent arm sleeve and inflating bulb with control valve, in morocco carrying case, $5\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{4}$ inches, with directions for use..... \$25.00
1348. **SPHYGMOMANOMETER**, Office Type, designed to be used on the table, or the wire frame may be removed and the case fastened directly to the wall. This instrument permits more accurate observations to be made than with the pocket type and in less time, as the instrument is always ready. It has a 6-inch silvered dial, long black hand and heavy case. Complete with 6 feet of rubber tubing, pneumatic bag, sleeve, inflating bulb and valve..... 37.50
- SYRINGES for Blood Testing**, see general heading **Syringes**.
1354. **UREA APPARATUS**, Marshall's for Blood, consisting of three 200 cc Erlenmeyer flasks with two-hole rubber stoppers, two glass cylinders 12×2 inches with two-hole rubber stoppers, one Drechsel gas washing bottle, two calcium chloride tubes with one-hole rubber stoppers, one No. 5476A Filter Pump, three special Folin absorption tubes, with necessary connecting tubes of glass and rubber, complete as illustrated, without supports. (See Journal of Biological Chemistry, Vol. XV, No. 3, for September 1915.) 9.75
1355. **Folin Tubes** only of No. 1354, with perforated bulbs each .45
1356. **Bulb Connecting Tubes** only of No. 1354..... each .35
1357. **Glass Connecting Tubes** only of No. 1354, L shape, long, for use in cylinders..... each .12
1358. **Glass Connecting Tubes**, L shape, short, for connecting flasks of No. 1354..... each .12
- For additional **UREA APPARATUS**, see **Urine Analysis Apparatus**.
- 14336B. **WASSERMANN BATH**, DeKhotinsky Electrically Heated and Regulated. Designed especially to provide an easily operated, dependable bath for use in routine sero-diagnostic work. The bath is made of heavy copper, tinned on the inside and covered on the outside with heavy asbestos slate, enameled in white. The two heating units are of the same type as used in our DeKhotinsky incubators, i. e., chromel wire spirals wound on mica strips. They are placed in a metal tube at the bottom of the bath where they are entirely surrounded by water. Provisions are made so that the units can be easily replaced in case of accidental injury. The bath may be used at a temperature of 56°C . as an inactivating bath, or at 37.5°C . for incubation purposes. The regulation is accomplished by means of the DeKhotinsky bimetallic thermoregulator provided with two pairs of contact points, which automatically throw into operation either one or both of the heating units as required. The thermoregulator is placed in a metal tube, which is immersed in the bath near the heating units. A pilot lamp is furnished for indicating when the current is on or off and to assist in setting the bath to operate at any required temperature. The operating temperature is easily changed by turning the knurled knob on the side of the thermoregulator. Two trays are furnished with places in each for 48 tubes up to $\frac{1}{2}$ inch in diameter, with the holes so marked that the location of any tube may be indicated by a number and letter. Size over all 11 by $11\frac{1}{2}$ by $5\frac{1}{2}$ inches. For 110 volts A. C. or D. C. Complete with test tube racks, thermometer, connecting cord and attachment plug, but without test tubes..... 65.00
- WASSERMANN PIPETTES**, see **Pipettes** No. 10506.
- WASSERMANN TUBES**, see **Test Tubes** No. 13390.



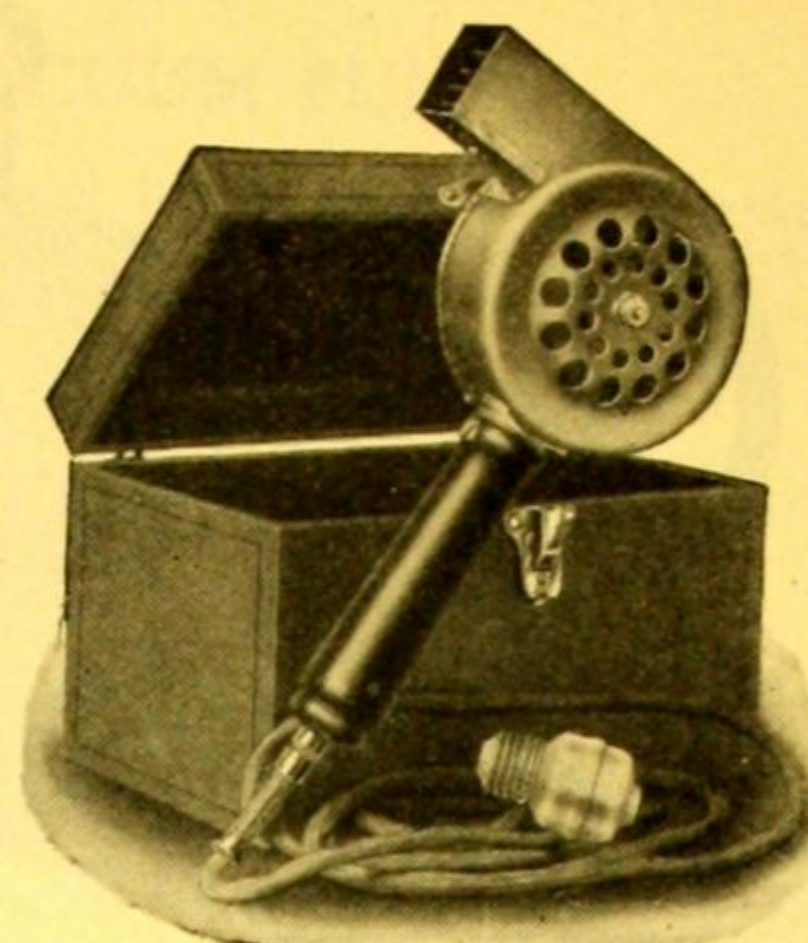
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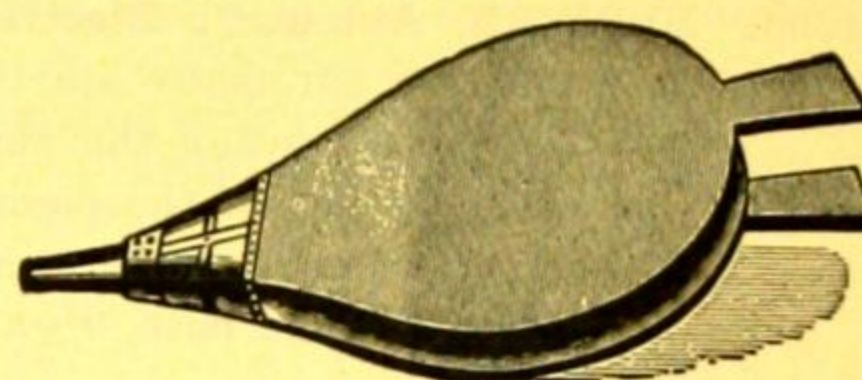
No. 1376.



No. 1382.



No. 1388.



No. 1380.

BLOWERS

1374. **BLOWERS, Foot, Fletcher's**, portable; give a steady and powerful blast.

No.	9	9A	9B
Diameter of air reservoir, inches.....	7 1/4	9	11
Pressure obtainable, per square inch, lbs.....	1	1 1/2	1 3/4
Capacity, per hour, cubic feet.....	190	330	625
Each	\$9.00	11.00	17.00

1376. **BLOWERS, Foot, Fletcher's**, mounted on legs with rubber reservoir underneath, thus obviating the risk of injury. Specifications are same as given under No. 1374.

No.	10	10A	10B
Each	10.00	12.75	18.50

1377. **RUBBER DISKS** for Nos. 1374 and 1376 Blowers.

Adapted to Nos.....	9 & 10	9A & 10A	9B & 10B
Number of disks required.....	1	2	3
Diameter, inches	9 1/8	11 1/2	14 1/4
Each	.50	.75	1.00

1378. **NETS** for Nos. 1374 and 1376 Blowers.

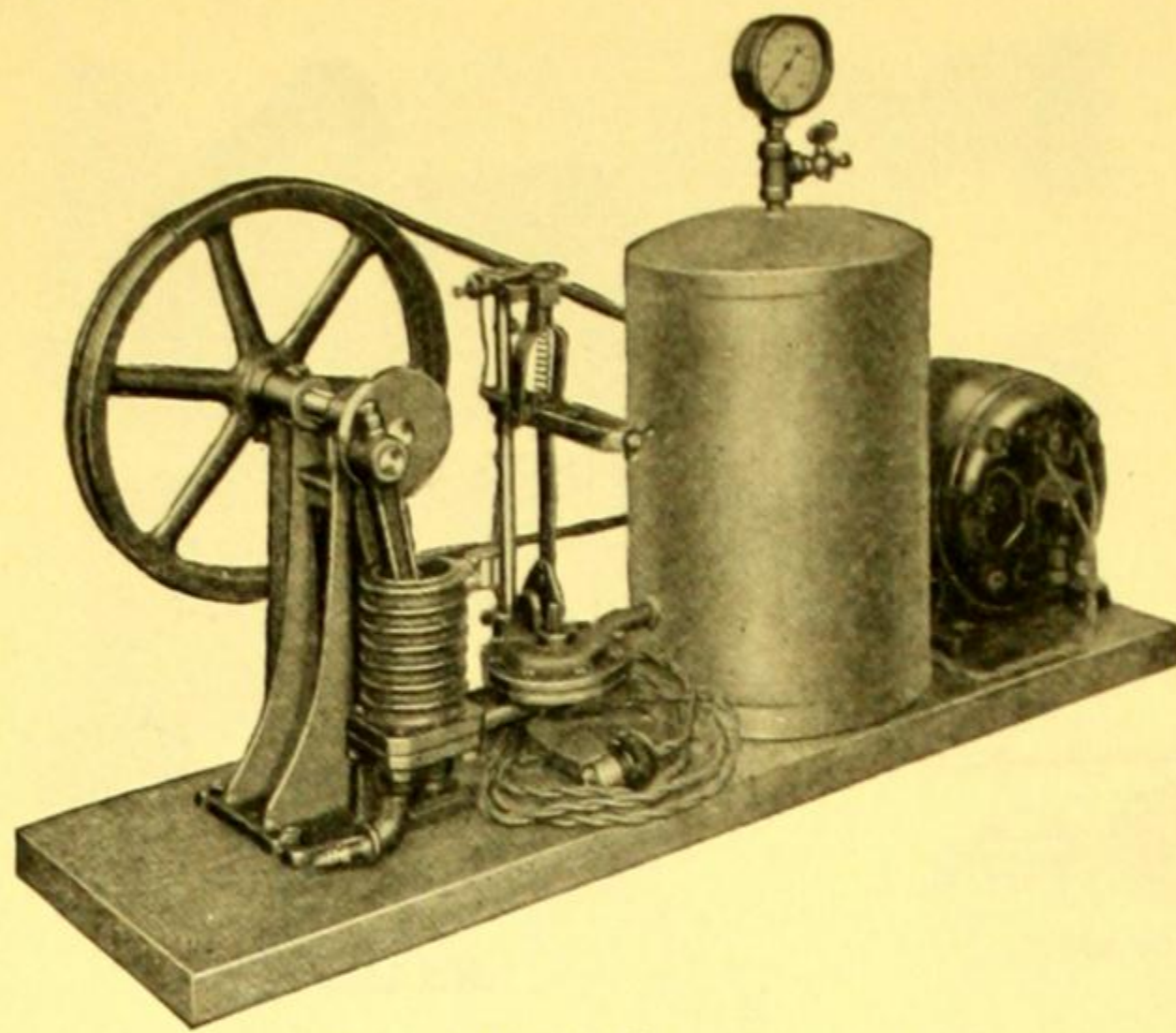
No.	A	B	C
For blower Nos.....	9 & 10	9A & 10A	9B & 10B
Each	.40	.50	.60

1380. **BLOWER, Hand Bellows**, 7 inches in diameter 1.40

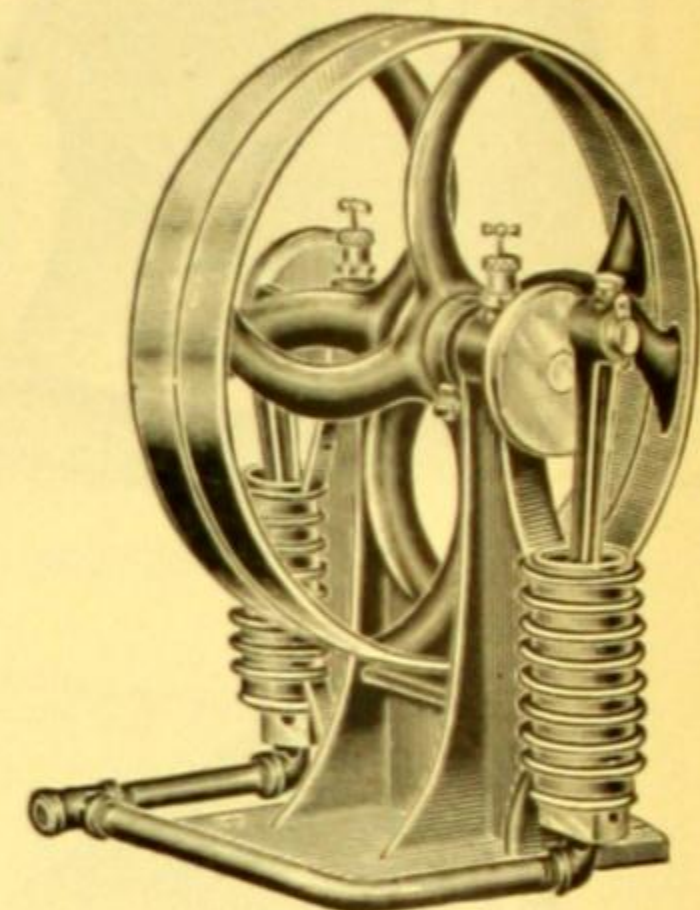
1382. **BLOWER, Hand**, of rubber, two bulbs, one covered with net for constant pressure..... 1.70

BLOWERS FOR POWER USE

1388. **BLOWERS, Hot Air**, electrically operated, for producing a constant stream of hot air; useful for quickly drying glassware such as large flasks, etc., also for promoting evaporations. Complete with double switch, one for blast at room temperatures, the other for hot air, and with cord and plug for attaching to lamp socket. For 110 volts A. C. or D. C..... 18.75



No. 1390.



No. 1394.

1390. **BLOWER, Automatic Electric Air Compressor and Exhaust Pump Combined.** Provided with switch for automatic starting and stopping of the motor at variations of pressure. This switch operates only when the pump is used for pressure and the tank is connected only with the pressure outlet of the pump. Suction is obtained by attaching a tube to a hose nipple at the base of the cylinder. Complete with four gallon tank, pressure gage and motor compactly mounted on one base, 9½x32 in.

Bore, in.	1⅝	For pressure up to, lbs.	40
Stroke, in.	2½	Vacuum up to, in.	26
Free air per minute at 200 r. p. m., cu. ft.	1½	Height over all, in.	25½
		Weight, lbs.	92
No.	A	B	C
For volts	110 A.C.	110 D. C.	220 D.C.
Size of motor, h. p.	⅛	⅛	⅛
Each	\$97.00	97.00	97.00

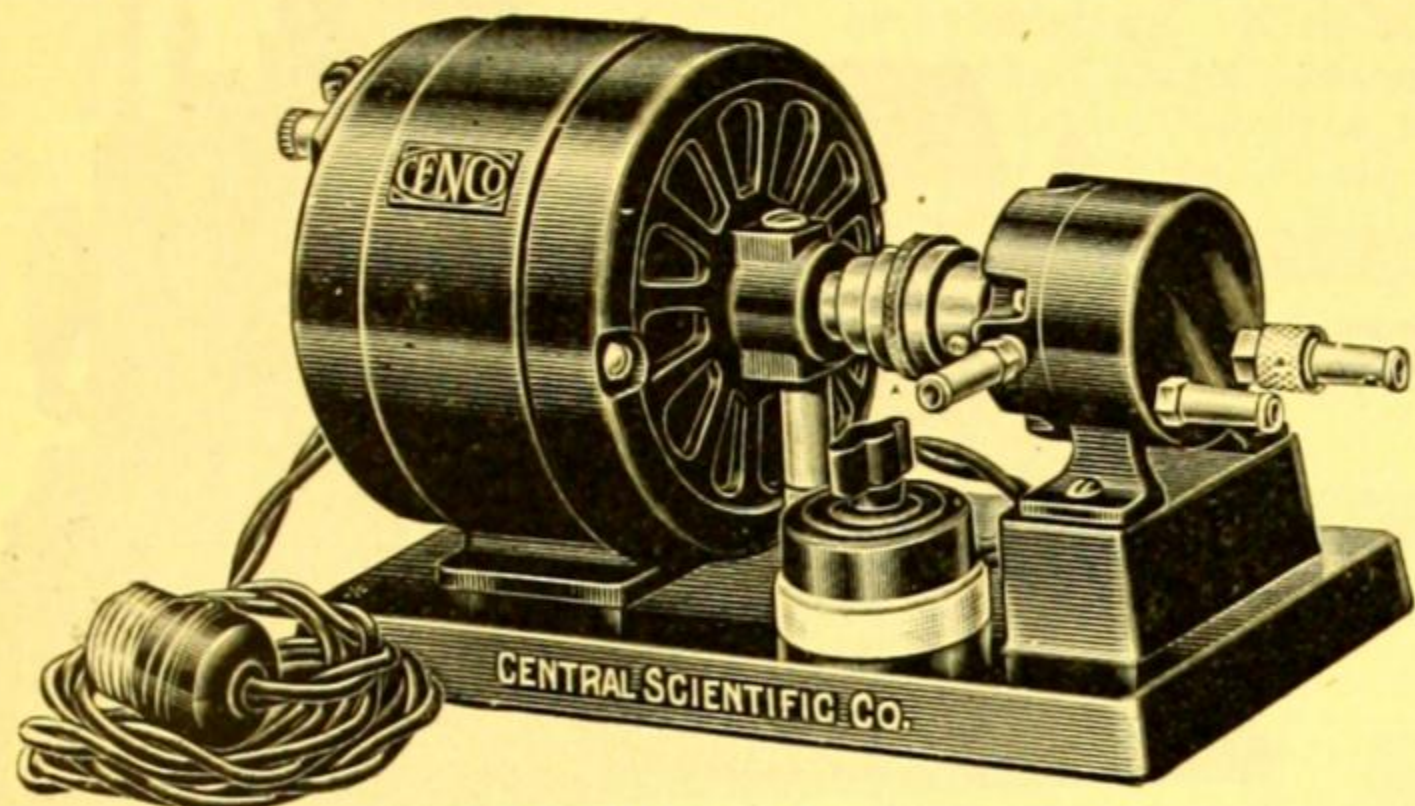
1394. **BLOWER, Twin Cylinder Air Pump, for power use.** A very desirable pump for producing a supply of compressed air for use in the laboratory. Can be used in conjunction with No. 1396 Tank listed below. The bearings are extraordinarily large and wide and if not allowed to run dry and cut will last for many years in daily use without appreciable wear. Cylinder is bored and reamed. Pistons have two cast iron split rings fitted with greatest care. Cylinder head and valve chest are in one piece, allowing larger valves than by any other construction. The intake valve stems project through a hole in the valve plate, allowing inspection or removal without disconnecting the discharge pipe. Exhaust valves are ball type, supported by stiff springs, insuring highest obtainable efficiency. Cooling flanges of correct size and design are used and all the metal in the pump is distributed to aid in radiating heat, as well as in making the compressor rigid, free from vibration, and unusually neat in appearance. Equipped with tight and loose pulley 12 inches in diameter by 1 inch face. All parts made to standard size and interchangeable.

Bore, inches	1⅝
Stroke, inches	2
Power required to operate, h. p.	1/3
Free air per minute at 400 r. p. m., cu. ft.	2
For pressure up to, lbs.	175
Each	29.50

1396. **TANK, of heavy galvanized iron, similar to that shown in illustration of No. 1390, 7½ gallons capacity, with 50 lb. pressure gauge, petcock on upper end and two ½ inch iron pipe size bushings in the side for making connections. Dimensions over all, diameter, 8½ inches; height, 30 inches** 13.50

CENCO ROTARY BLOWER AND VACUUM PUMPS

1398. **BLOWER AND VACUUM PUMPS, Cenco Rotary, Electrically Driven**, for producing a blast for the operation of blast lamps and for use with other laboratory devices requiring moderate air pressure or vacuum. The blowers are of small size, very compact, and with few parts. They are free from mechanical troubles and require practically no attention except an occasional oiling. They are mounted on a cast iron base, direct connected to a constant speed motor of generous size, and are provided with a valve on the outlet tube, by means of which the air pressure can be varied. The outer casing of the blower is water jacketed so that the heat developed by compression during continuous use may be removed.



No. 1398.

SPECIFICATIONS.

Size of base, 5x9½ inches.
 Speed, 1725 r. p. m.
 Pressure at maximum speed, 7 lbs. per square inch.
 Cubic feet of air per minute, 0.75.
 Number of blast lamps operated simultaneously, 2.
 Vacuum at maximum speed, 16 inches of mercury.
 Power consumption, 66 watts.
 Jacket water cooled to prevent heating on continuous use.
 Complete with 1/20 h. p. direct connected motor and pressure regulator, mounted on japanned iron base.

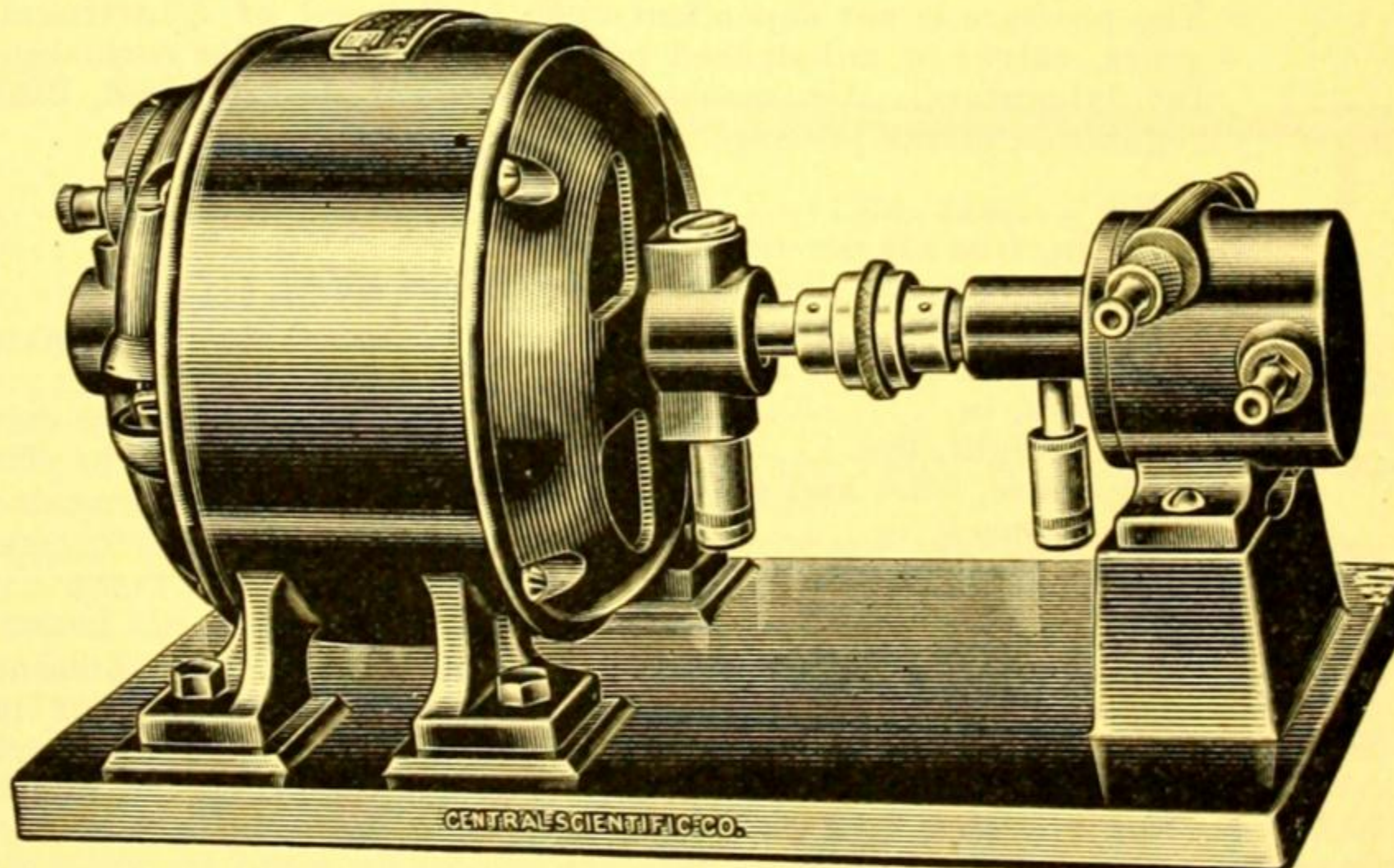
No.	A	B	C	D
For volts		A. C.		D. C.
	110	220	110	220
Each	\$48.00	50.00	48.00	50.00

1399. **BLOWER AND VACUUM PUMP** only of No. 1398, with grooved pulley, but without base, motor or other accessories..... 15.00

1400. **BLOWER AND VACUUM PUMPS, Cenco Rotary, Electrically Driven**, similar to No. 1398, but of larger size and capacity.

SPECIFICATIONS.

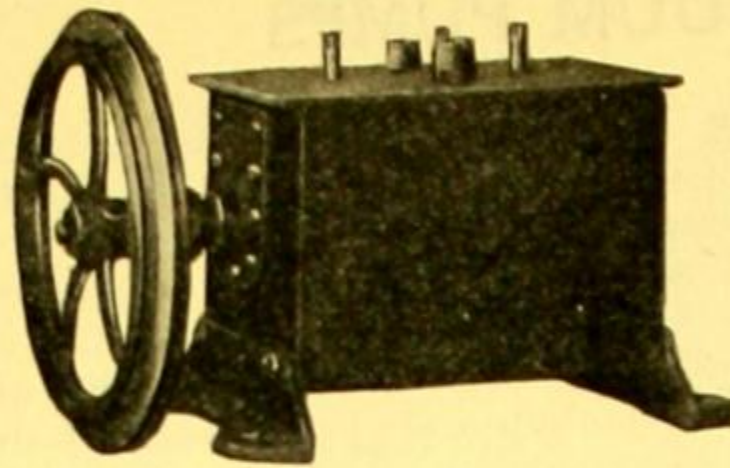
Size of base, 13x7¾ inches.
 Speed, 1725 r. p. m.
 Pressure, 10 lbs. per sq. in.
 Cubic feet of air per minute, 1.4.
 Number of blast lamps operated simultaneously, 4.
 Vacuum, 18 in. of mercury.
 Power consumption, 175 watts.
 Jacket water cooled to prevent heating on continuous use.
 Complete with ⅛ h. p. direct connected motor and pressure regulator, mounted on japanned iron base.



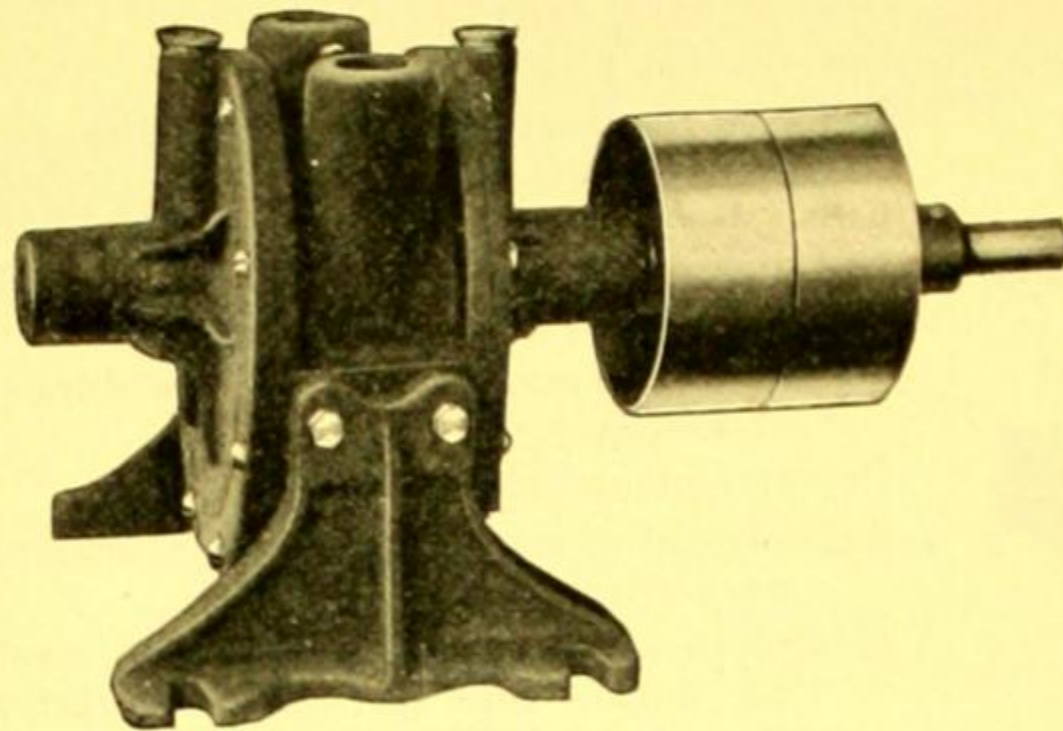
No. 1400.

No.	A	B	C	D
For volts		A. C.		D. C.
	110	220	110	220
Each	63.00	66.00	57.00	60.00

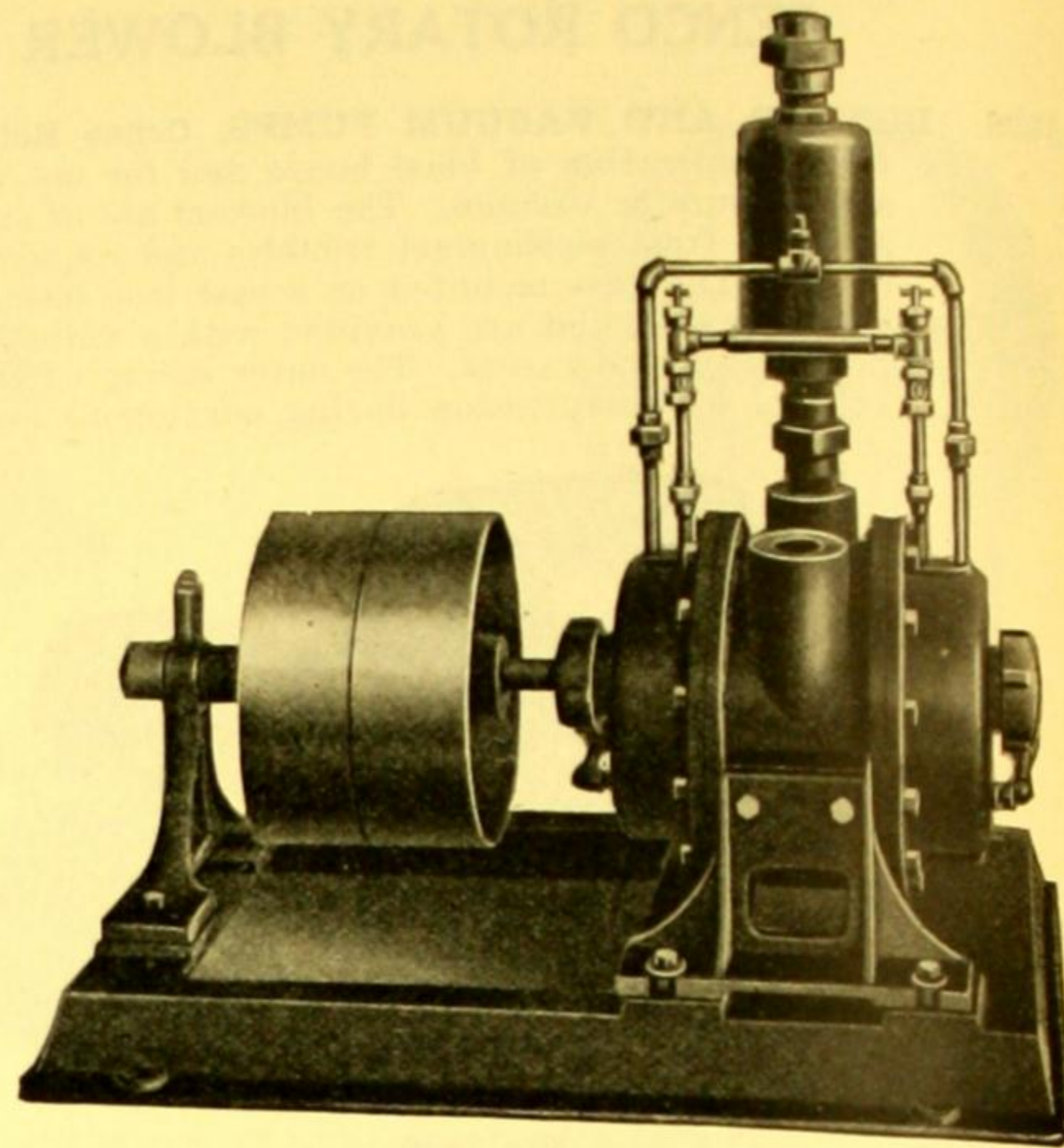
1401. **BLOWER AND VACUUM PUMP** only of No. 1400, with grooved pulley, but without base or motor 18.50



No. 1402.



No. 1406 (3-A & 4-A).



No. 1408.

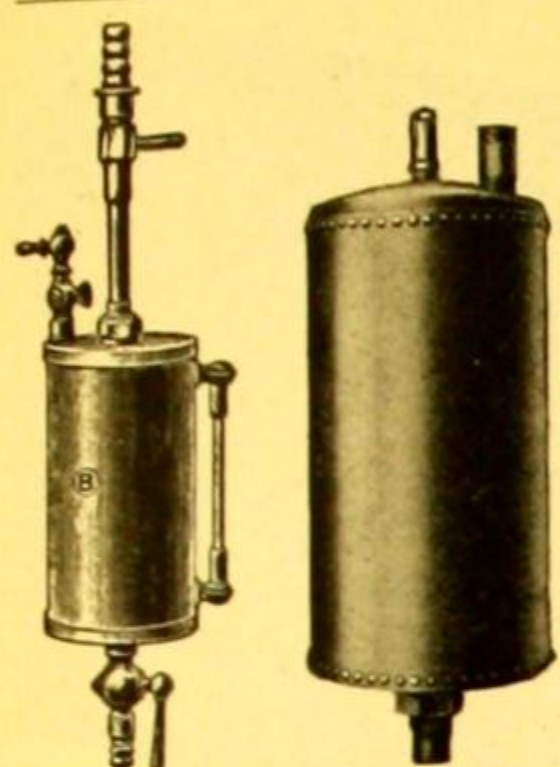
1402. **BLOWER and VACUUM PUMP, Crowell Rotary (No. 0-D).** This pump is used principally for vacuum work, giving from 29 to 30 in. of mercury, according to atmospheric conditions. It is fitted in an oil immersion box, which makes it practically leak-proof. Capacity about 2 cu. ft. of free air per minute. Inlet and outlet tapped for $\frac{1}{2}$ in. pipe size. Requires about $\frac{1}{4}$ h. p. to operate \$66.00

1406. **BLOWER and VACUUM PUMPS, Crowell Type A.** Adapted for all purposes requiring air under pressure of from 1 to 10 lbs. to the square inch and any degree of vacuum not exceeding 24 in. The pressure is not dependent upon high speed or centrifugal force. There are no springs, gears, valves or unbalanced parts. Satisfactory for furnishing vacuum or pressure throughout the laboratory. Air receivers are usually not required, but are of advantage where a close regulation of the pressure is desirable. (See No. 1410.)

No.	1-A	3-A
Cu. in. free air per revolution.....	20	125
Cu. ft. free air per min. at maximum speed.....	6.9	25.3
R. p. m. at maximum speed.....	600	350
Approx. h. p. at 3 lbs. pressure.....	$\frac{1}{8}$	$\frac{1}{2}$
Pulleys, in.	4x1	6x2 $\frac{1}{2}$
Net weight, lbs.....	24	90
Pipe size, inlet and outlet, in.....	$\frac{1}{2}$	1
Floor space, in.	10x6 $\frac{1}{4}$	22x14
Each, without air receiver.....	28.00	58.00

1408. **BLOWER and VACUUM PUMPS, Crowell Type D.** For pressures up to 25 lbs. per square inch and vacua from 29 to 30 in. of mercury. The system of lubrication is positive and automatically controlled by the air pressure. The heads are provided with water jackets for cooling. Construction throughout is heavier than Type A, adapting this type for heavier duty. (For Air Receivers see No. 1410.)

No.	1-D	2-D	3-D
Cu. in. free air per revolution.....	15	40	100
Cu. ft. free air per minute at maximum speed.....	4.3	9.2	17
R. p. m. at maximum speed.....	500	400	300
Approx. h. p. at 15 lb. pressure or 29 in. vacuum.....	$\frac{1}{2}$	1	2
Pulleys, in.	6x2	8x2	12x4
Approx. net weight, lbs.....	70	115	250
Pipe size, inlet and outlet, in.....	$\frac{1}{2}$	$\frac{3}{4}$	1
Floor space, in.....	13x18	14x22	19x34
Each, without air receiver.....	78.00	95.00	125.00



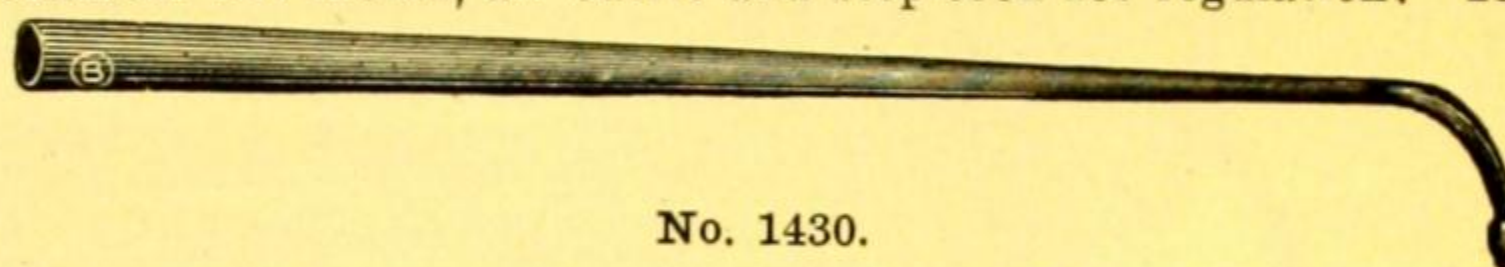
No. 1414.

No. 1410.

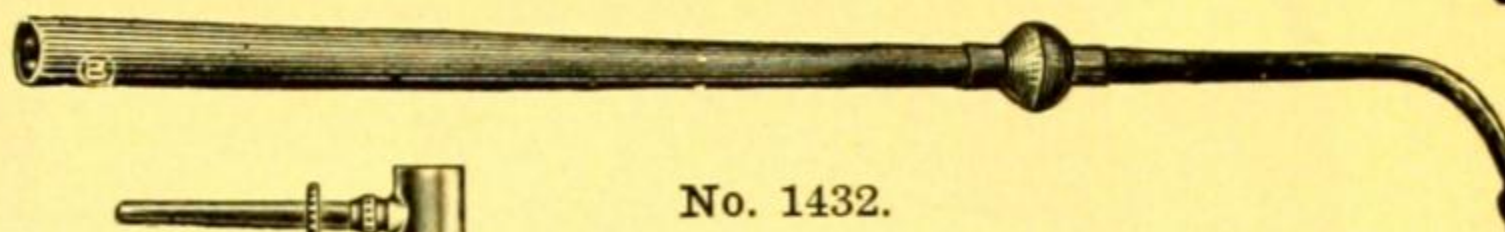
1410. **AIR RECEIVERS** for Nos. 1406 and 1408, which can be set to blow off at any desired pressure by turning the adjusting nut.

No.	1	2	3
For Blower No.	1-A or D	2-A or D	3-A or D
Height, inches	12	12	20
Length, over all, inches	18	18	26
Diameter, inches	8	8	10
Capacity, gallons	2.6	2.6	6.8
Net weight, lbs.	15	15	28
Pipe size, inlet and outlet, inches.	1/2	3/4	1
Each	\$12.00	12.00	14.50

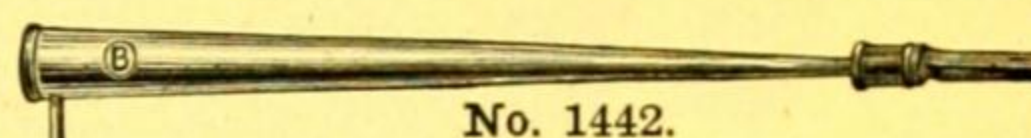
1414. **BLOWER**, Muencke's, operated by water blast for either compressing or exhausting. With 30 pounds pressure it will run two ordinary sized blast lamps. Intended for connecting to water supply by rubber tubing. Complete with one Filter Pump No. 5476, zinc water chamber 4x8 inches, air outlet and stop-cock for regulation. 18.00



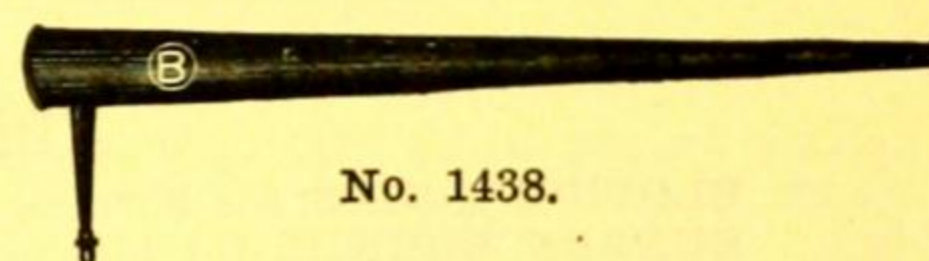
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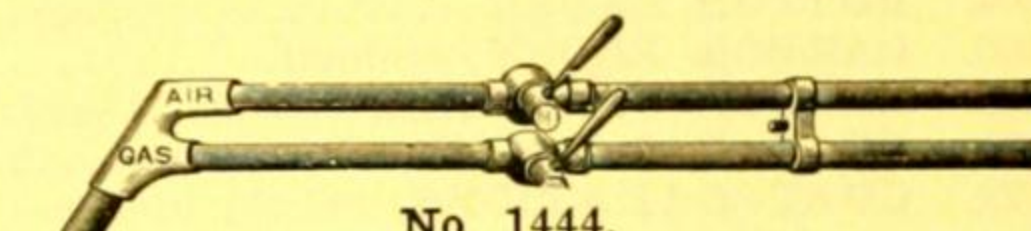
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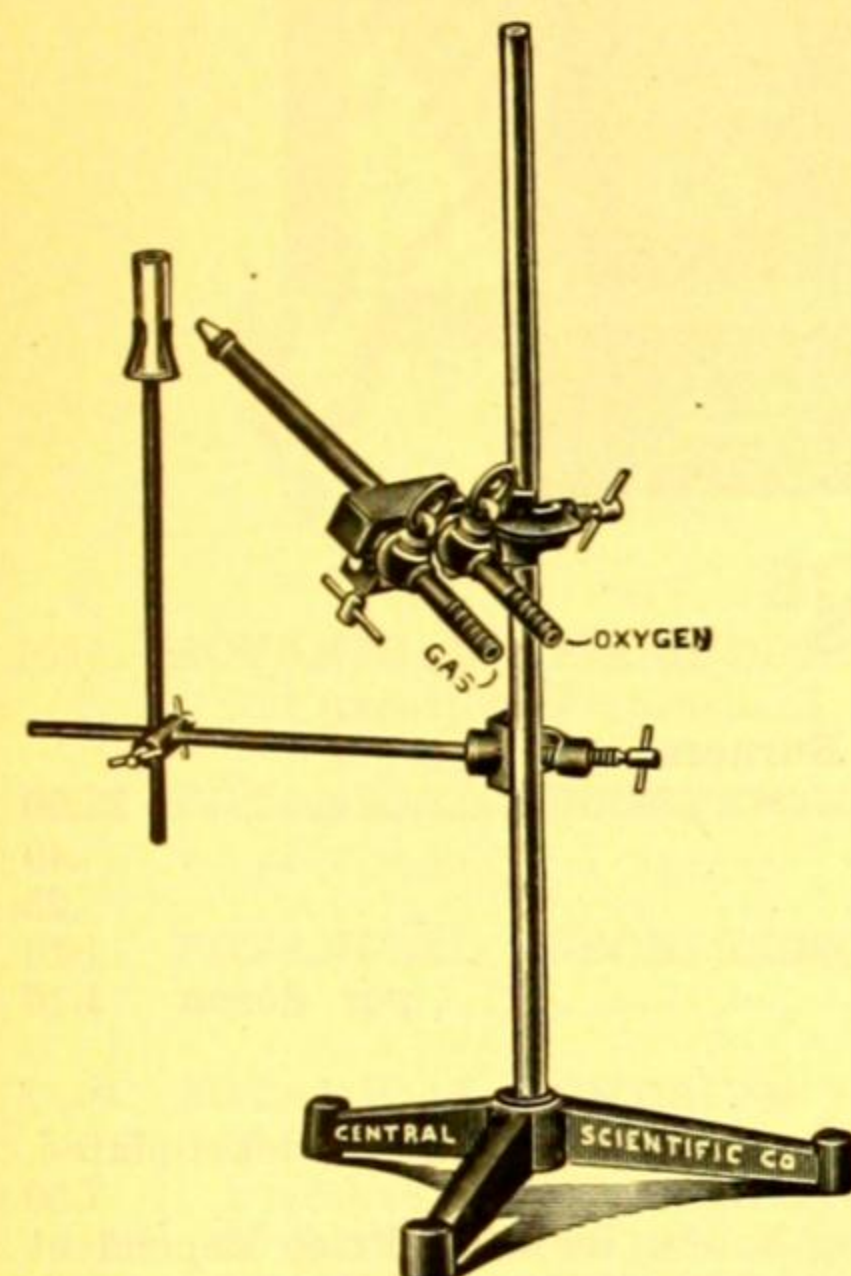
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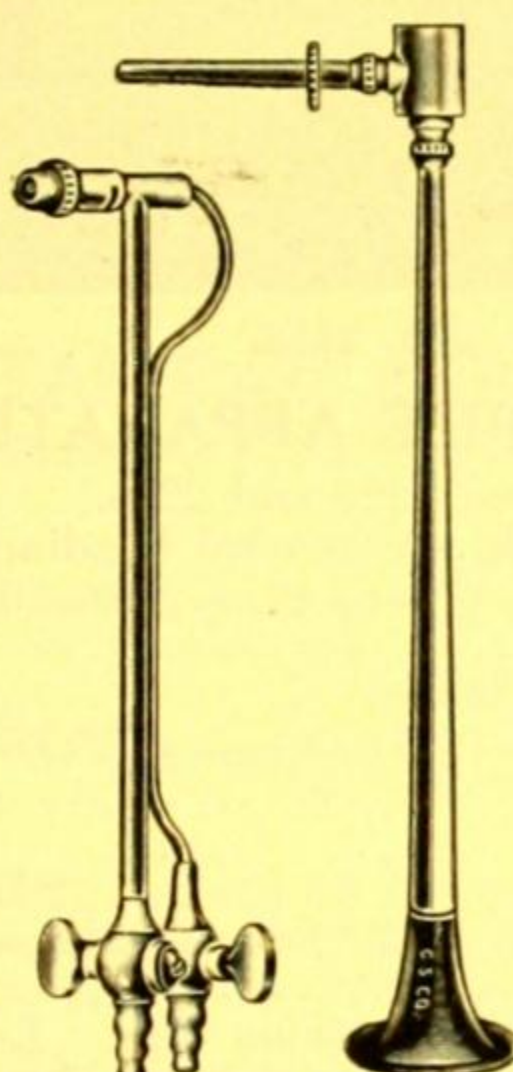
No. 1438.



No. 1444.



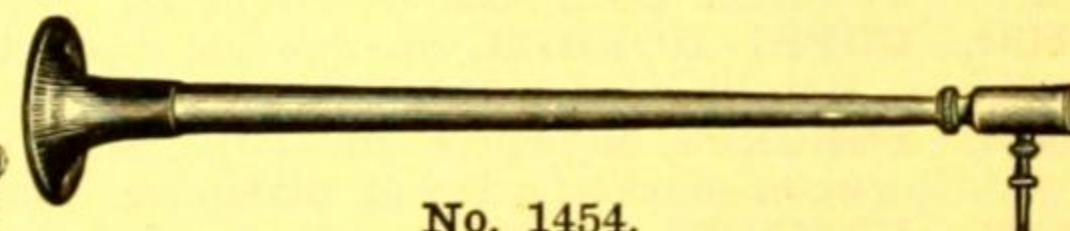
No. 1450.



No. 1448.



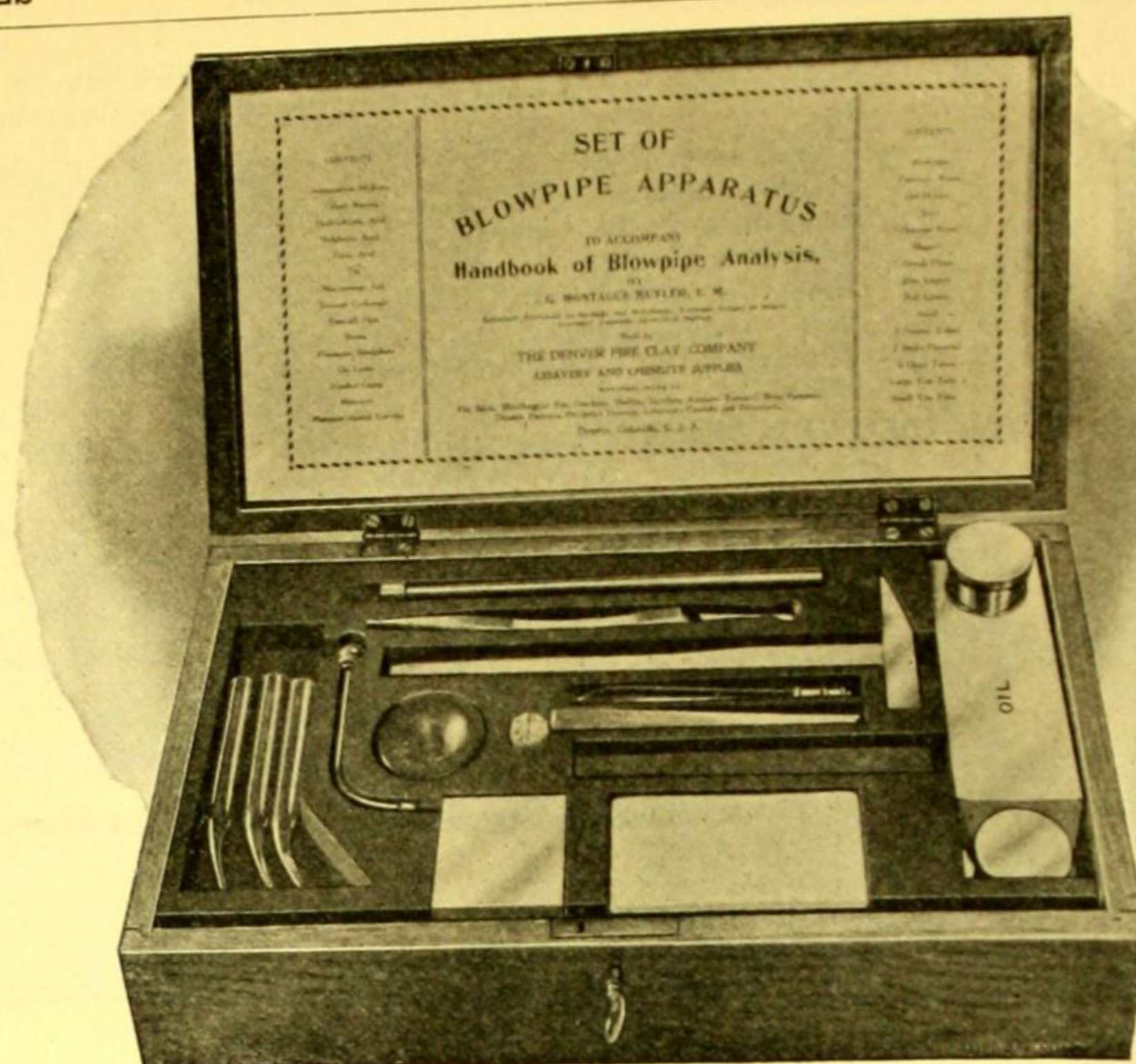
No. 1436.



No. 1454.

BLOWPIPES

1430. **BLOWPIPES**, of brass, plain. Length, inches 8 10
Each \$0.18 .20
1432. **BLOWPIPES**, of brass, with air chamber. Length, 10 inches each .55
1433. **BLOWPIPE MOUTHPIECE**, of wood to fit blowpipes Nos. 1430 and 1432.....each .18
- 10% discount in lots of 12 from Nos. 1430-2-3.
1436. **BLOWPIPE**, Berzelius Form, of brass, with hard rubber mouthpiece and platinum plate placed on end of jet. Can be taken apart..... 3.25
1438. **BLOWPIPE**, Black's, japanned tin, removable brass tip. Length, 8 1/2 inches..... .18
1439. **BLOWPIPE TIPS** for No. 1438..... per dozen 1.10
1442. **BLOWPIPE**, Black's, new form, of brass, with removable tip that unscrews and wooden mouthpiece. Length, 9 1/2 inches..... .90
1444. **BLOWPIPE**, Brazing, of brass with stop-cocks for air and gas. Requires 3/8 inch gas supply. Size of air tube, 3/16 inch; of gas tube, 7/16 inch; length over all, 14 inches..... 3.00
1448. **BLOWPIPE**, General Laboratory, of brass nickel-plated. The most convenient form of hand blowpipe or blast; of very light weight. Provides intensely hot flame, which is easily regulated in size and intensity from the finest needle flame to a large brush, by means of stop-cocks on the air and gas tubes. Especially valuable in sealing glass and in repairing large pieces not easily handled. Total length, 9 inches; weight, 4 1/2 ounces..... 6.00
1450. **BLOWPIPE**, Oxy-Hydrogen, all brass, on stand, with removable lime cylinder holder and two stop-cocks 12.00
1454. **BLOWPIPE**, Plattner's, of brass nickel-plated, with hard rubber mouthpiece, but without platinum tip. (See No. 1455 below)..... 2.00
1455. **BLOWPIPE TIP**, of Platinum, for No. 1454, seamless, with small uniform hole. Price dependent upon the market price of platinum.



No. 1518.

BLOWPIPE APPARATUS

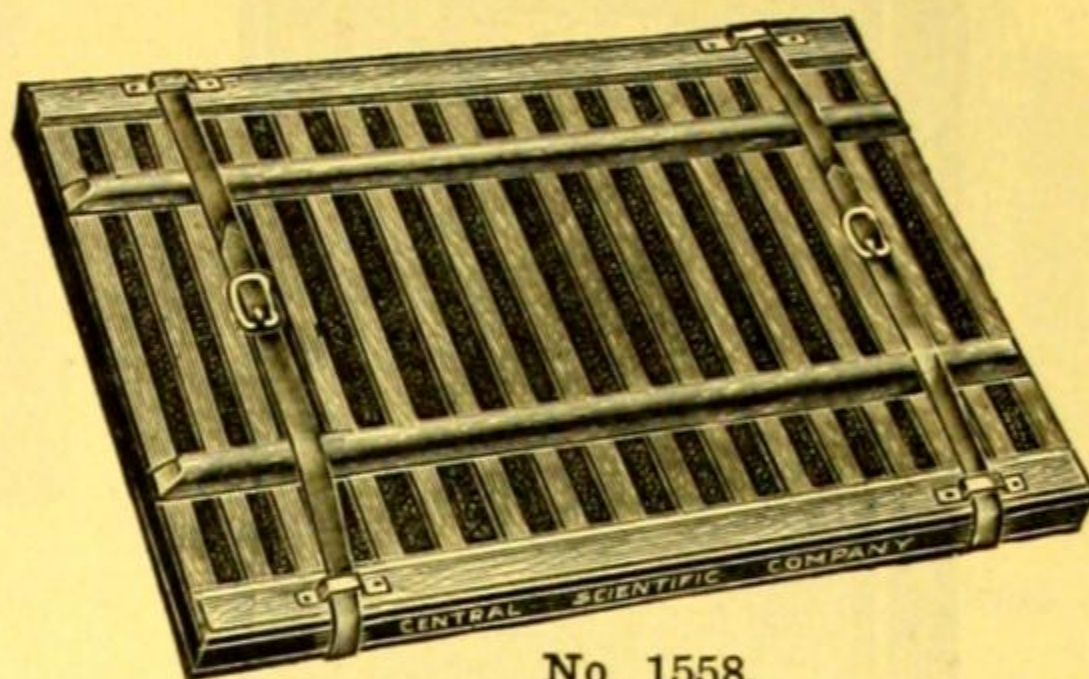
BLOWPIPE TIPS for burners, see Nos. 2228 and 2230.

BUNSEN BURNER for blowpipe work, see general heading Burners.

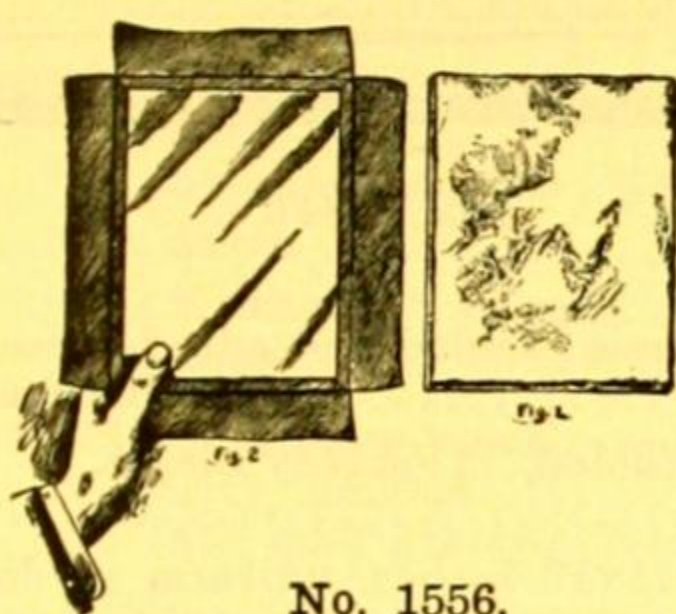
1464. **BUTTON BRUSH**..... \$1.00
 1466. **CARBON BLOCK**, molded..... .40
 1468. **CARBON CYLINDER**, molded, $1\frac{1}{8} \times 3$ inches..... .25
 1470. **CHARCOAL BORER**, club shape..... 1.10
 1478. **CHARCOAL STICKS**, $4 \times 1 \times \frac{1}{2}$ inches..... per dozen 1.10
 10% discount in lots of 144.
 1484. **CUPELS**, Bone Ash, see No. 3628.
 1484. **CUPEL HOLDER**, on wooden support, with two molds and stamp of brass, nickel-plated. Height, about $3\frac{1}{2}$ inches..... 1.50
 1486. **FORCEPS**, Blowpipe, nickel-plated, with platinum tips. Length $5\frac{1}{2}$ inches. Price dependent upon market price of platinum. (For illustration, see Forceps, page 245.)
 1488. **HAMMER**, Plattner's, wooden handle..... .90
 1492. **MATRASSES**, Glass, flask shape..... per dozen .50
 1496. **MINERALS** for Blowpipe, 25 specimens, small size, in partitioned hardwood box..... 3.60
 1500. **MINERALS** for Blowpipe, 100 specimens, including all but the very rarest, each in tray, all enclosed in oak box..... 9.50
 1502. **PLATINUM WIRE**, with solid glass handle, for borax beads, etc..... .50
 PLATINUM GOODS, see general heading Platinum Ware.
 1508. **SCALE** of Hardness, without diamond, 9 specimens..... 3.15
 300. **STREAK PLATE**, unglazed porcelain, $60 \times 100 \times 4$ mm thick..... .48
 1514. **TUBES**, hard glass, $4 \times \frac{1}{4}$ inches, open at both ends..... per dozen .55
 1516. **TUBES**, hard glass, $4 \times \frac{1}{4}$ inches, closed at one end..... per dozen .90
 1518. **BLOWPIPE SET** of Apparatus and Reagents, as designed by Prof. Butler of the Colorado School of Mines for use in the laboratory and field. The various pieces are compactly arranged in a case with compartments and receptacles, especially designed to avoid breakage. Outside dimensions, $11\frac{3}{4} \times 6\frac{1}{2} \times 2\frac{3}{4}$ inches. Complete with wet and dry fluxes, and with lamps for alcohol and oil..... 30.00
 The set contains the following pieces:—
 Blowpipe
 Platinum Wires and Holder
 Combination Charcoal Borer,
 Magnet and Chisel
 Streak Plate
 Blue Litmus
 Red Litmus
 Anvil
 3 Arsenic Tubes
 2 Sticks Charcoal
 6 Open Tubes
 Large Test Tube
 Small Test Tube
 Ammonium Hydrate
 Cobalt Nitrate
 Hydrochloric Acid
 Sulphuric Acid
 Nitric Acid
 Tin
 Microcosmic Salt
 Sodium Carbonate
 Bismuth Flux
 Borax
 Potassium Bisulphate
 Oil Lamp (brass)
 Alcohol Lamp (brass)
 Hammer
 Platinum Tipped Forceps
1520. **POCKET HAND-BOOK OF BLOWPIPE ANALYSIS**, by G. Montague Butler, M. E..... 1.25
BOATS, Combustion, see Combustion Boats.
BOILERS, see Kettles.
BOLTING CLOTH, see Sieves.



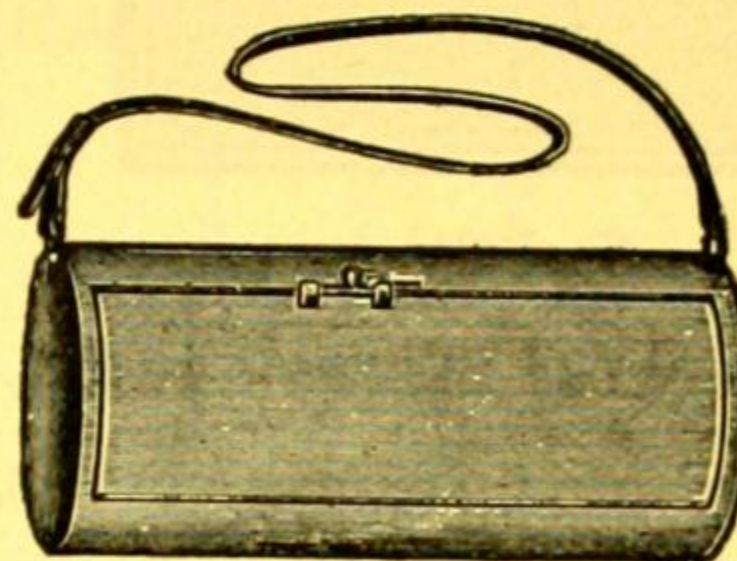
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No. 1558.



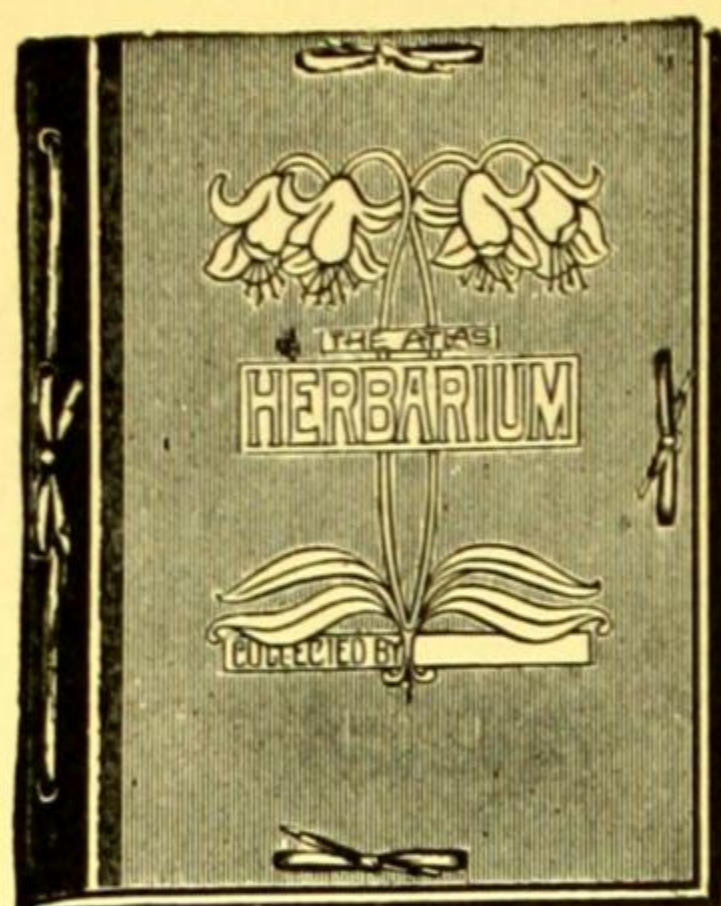
No. 1556.



No. 1538.

BOTANICAL APPARATUS

1530. **BOTANICAL ABSORPTION PAPER**, 11x16 inches, as used in No. 1558 Plant Press. Heavy felt paper, very absorbent.....per 25 sheets \$0.85
per 100 sheets 2.50
1532. **BOTANICAL ABSORPTION PAPER**, good quality blotting paper, size, 12x19 inches.
per 25 sheets .60
per 100 sheets 1.80
1533. **BOTANICAL ABSORPTION PAPER**, same as No. 1532, but in sheets 19x24 inches.
per 25 sheets 1.25
per 100 sheets 3.70
1536. **BOTANICAL ADHESIVE TAPE**, in rolls of 10 yards, $\frac{3}{4}$ inch wide, gummed, ready for use. Made of white cloth, easily cut and readily applied, presenting a neat and inconspicuous appearance on the mounting sheet. In box with slot enabling it to be withdrawn in any amount. 20% discount in lots of 12.....per roll .40
1538. **BOTANICAL COLLECTING CASE (Vasculum)**, of metal, finely enameled in green, with door opening entire length. Size $15\frac{3}{4} \times 5 \times 7\frac{1}{8}$ inches. Complete with leather shoulder strap and snaps 2.80
1540. **BOTANICAL GENUS COVERS**, of heavy manila paper, with surface specially prepared for writing upon. Size folded, 12x18 inches.....per 25 sheets .80
per 100 sheets 2.30
1548. **BOTANICAL MOUNTING BOARD**, good quality Bristol board, plain. Size, 11x17 inches.
per 25 sheets 1.70
per 100 sheets 5.00
1549. **BOTANICAL MOUNTING BOARD**, same as No. 1548, but with printed form for plant description. Size, 11x17 inches.....per 25 sheets 2.35
per 100 sheets 7.00
1552. **BOTANICAL MOUNTING PAPER**, of heavy unsized stock, strong and durable. Color does not deteriorate with age. Size, 11x17 inches.....per 25 sheets .57
per 100 sheets 1.70
1554. **BOTANICAL MOUNTING PAPER**, heavy weight paper of grayish color, unsized surface. Size, 11x17 inchesper 25 sheets .35
per 100 sheets 1.10
1556. **BOTANICAL MOUNTS**, Riker's, suitable for mounting any botanical specimen. The mount consists of two parts—a thin plate of photographic glass to which narrow flaps of linen morocco paper are neatly fastened, and a cardboard back to which is glued a thin layer of sterilized surgical cotton in which the specimens are imbedded.
- | No. | A | B | C | D |
|--------------|------|------------------------------------|------|-------|
| Size, inches | 5x6 | $6\frac{1}{2} \times 8\frac{1}{2}$ | 8x12 | 12x16 |
| Each | .28 | .35 | .60 | 1.20 |
| Per dozen | 2.80 | 3.50 | 6.00 | 12.00 |
- For other MOUNTS, see Specimen Mounts.
1558. **BOTANICAL PLANT PRESS**, simple, strong, portable, and satisfactory. Made of lattice work. It dries very rapidly, especially when used with No. 1530 Absorption Paper. Hung in sunlight or over a heater, specimens can be dried so rapidly as to preserve natural colors. From one to fifty or more specimens may be pressed at one time. Size, $11\frac{3}{8} \times 16\frac{3}{8}$ inches. Complete with straps as illustrated... 2.75



No. F8841.

No. F8847.

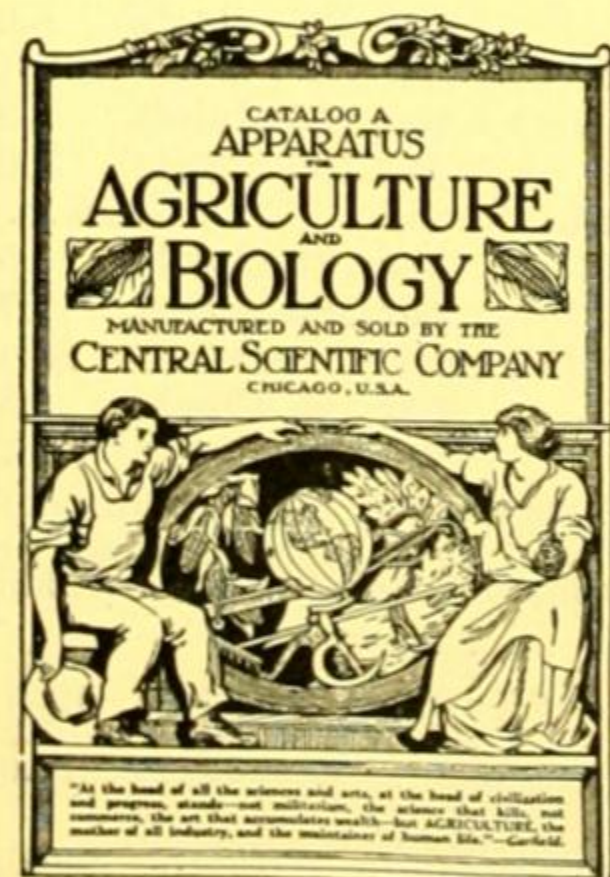
1562 **BOTANICAL PRESSING PAPER**, thin white absorbent paper, folded and cut, for use with No. 1530 Absorption Paper.....per 100 sheets \$0.50

1564. **BOTANICAL SPECIES COVERS**, of manila paper, size folded, $11\frac{1}{2} \times 17\frac{1}{2}$ inches.
Per 100 sheets..... 1.20

HERBARIUMS. Made in two sizes, $7\frac{3}{4} \times 9\frac{3}{4}$ inches, and 11×17 inches, uniform in design with the Atlas Note Books. The portfolio form permits the specimens to be mounted scientifically according to the genus and species to which they belong. The plan also permits adding to or removing from the collection at any time. Hints on collecting, pressing and mounting specimens are found on inside cover pages. Each sheet contains a legend for classification, and an index is furnished.

No.	A	B
Atlas No.	709	1117
Size, inches	$7\frac{3}{4} \times 9\frac{3}{4}$	11×17
No. of sheets.....	40	25
F8841. HERBARIUM , complete, as described above.....	each .45	.70
	per dozen 4.20	6.72
F8842. HERBARIUM COVERS , only.....	per set .22	.27
	per dozen sets 2.10	2.64
F8843. MOUNTING SHEETS , only.....	per package of 100 .70	2.50
	per dozen packages of 100 each 6.72	24.00
F8847. PLANT DESCRIPTION PAPER , with spaces on one side for complete analysis of a plant; the other side unruled. $7\frac{3}{4} \times 9\frac{3}{4}$ inches, perforated for Nos. F8811 or F8842A Covers. In envelope of 20 sheets.....	per envelope .12	
	per dozen envelopes 1.08	

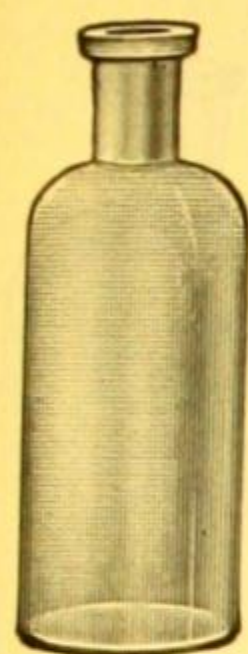
CATALOG A.



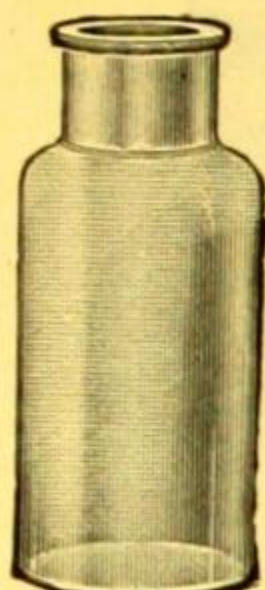
Catalog A, illustrated here, is a complete catalog of those items which are of specific interest to laboratory workers in the fields of Botany, Physiology, Zoology and Agriculture. In its 227 pages are contained much of the material scattered throughout Catalog C, and because of its smaller size and more limited scope it may be found more convenient to use by those primarily interested in these special fields. In addition it contains certain special sections of apparatus not included in C, such as Animal Husbandry; Charts for Botany, Physiology and Agriculture; Forestry Instruments; Insect Specimens and Life Histories; Anatomical and Physiological Models; Poultry Husbandry; Pruning, Budding and Grafting Tools; Score Cards for Judging Animals, etc.; Seed and Grain Specimens; Prepared Slides for the Microscope and Projection Lantern; Spraying Apparatus.

This catalog will be sent post paid to any teacher of the subjects mentioned, any experiment station investigator, or to the head of any laboratory, public or commercial, whose work carries over into any of these fields.

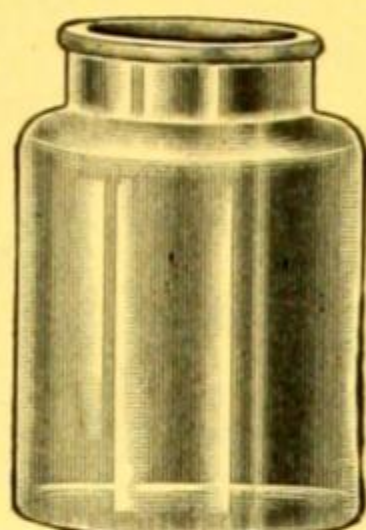
Note.—For notices of other catalogs, see page 68, 311 and 375.



No. 1574.



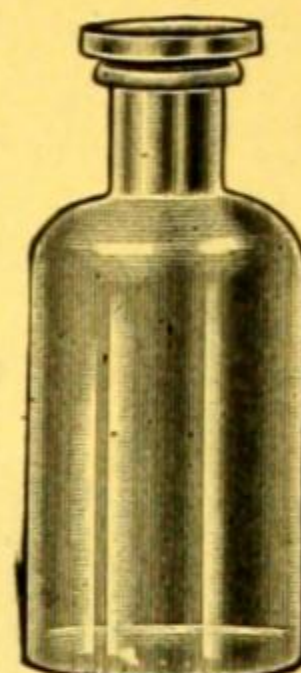
No. 1578.



No. 1582.



No. 1584.



No. 1586.

BOTTLES FOR GENERAL USE

1574. BOTTLES, narrow mouth, round, flint glass.

Capacity, ounces	1/2	1	2	4	6	8	12	16	32	64
To take cork stopper, No...	0	1	2	4	4	5	6	6	8	13
Per dozen	\$0.65	.70	.77	1.06	1.22	1.40	1.78	2.00	3.05	4.00
33 1/3% discount in case containing	864	864	720	432	360	288	216	144	72	48

1576. BOTTLES, narrow mouth, round, flint glass.

Capacity, gallons	1/2	1	2	5
To take cork stopper, No.....	10	13	15	18
Each	.35	.50	1.50	2.50
33 1/3% discount in case containing.....	36	24	12	6

1578. BOTTLES, wide mouth, round, flint glass.

Capacity, ounces	1/2	1	2	4	6	8	12	16	32	64
To take cork stopper, No...	7	10	11	14	15	20	18	22	26	25 1/8"
To take rubber stopper, No..	2	4	5	6	7	8	8	9	11	13
Per dozen	.67	.73	.80	1.12	1.28	1.45	1.88	2.12	3.15	4.20
33 1/3% discount in case containing	864	864	720	432	360	288	216	144	72	48

1580. BOTTLES, wide mouth, round, flint glass.

Capacity, gallons	1/2	1	2	5
Each	.30	.50	1.35	2.80
33 1/3% discount in case containing.....	48	24	12	6

1582. BOTTLES, extra wide mouth, round, flint glass. "Specimen Bottles."

Capacity, cc	30	50	75	100	150	200
Diameter of body, mm.....	43	50	57	62	66	70
Height over all, mm.....	50	60	65	70	85	96
To take cork stopper, No.....	13	15	15	22	22	22
To take rubber stopper, No.....	6	6	6	9	9	9
Per dozen	1.00	1.10	1.25	1.50	1.65	1.75
33 1/3% discount in case containing.....	864	720	576	432	360	288

1584. BOTTLES, tincture, flint glass, mushroom stopper.

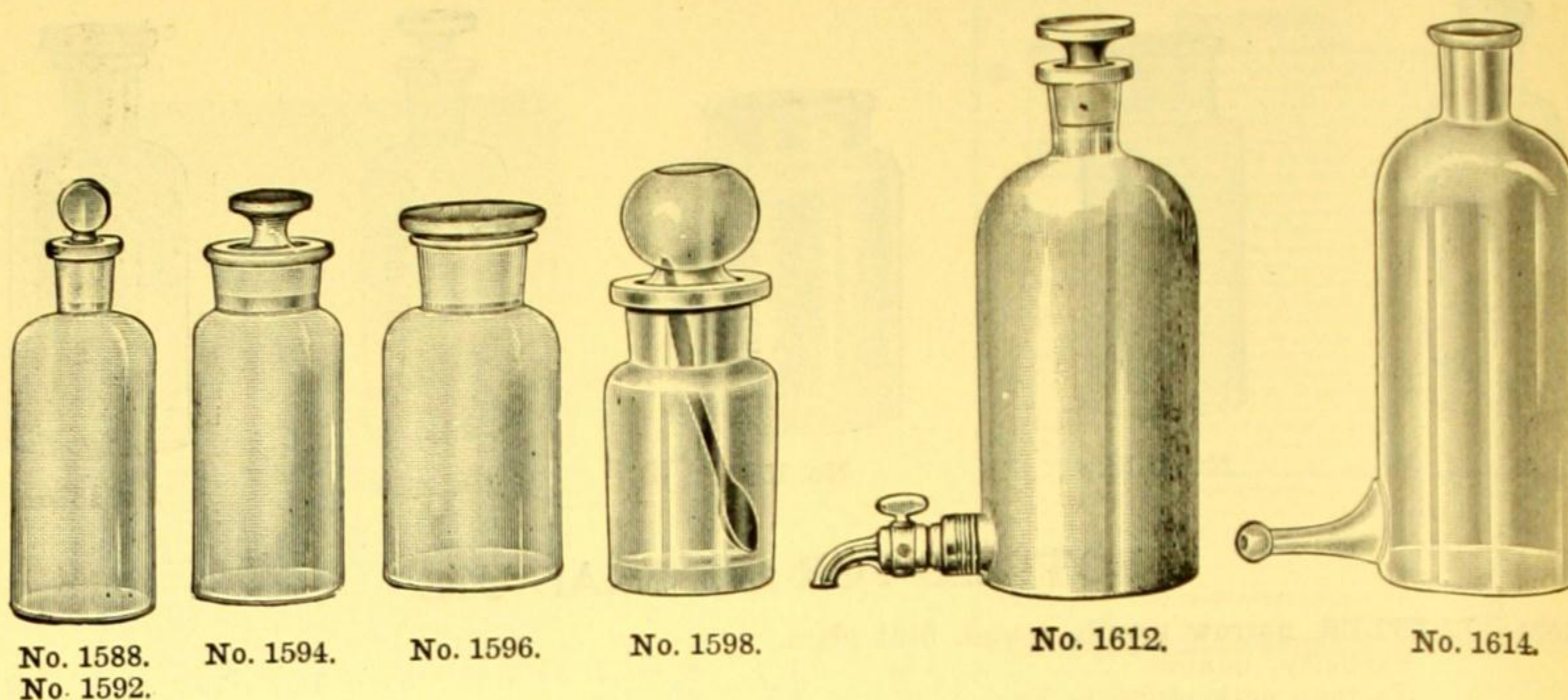
Capacity, ounces	1	2	4	8	16	32
Per dozen	2.05	2.25	2.75	3.35	4.70	6.45
33⅓% discount in case containing.....	864	720	432	288	144	72
Capacity, gallons			½	1		2
Each			.90	2.50		4.50
33⅓% discount in case containing.....			48	24		12

1586. BOTTLES, tincture, flint glass, squat form, with flat topped glass stopper.

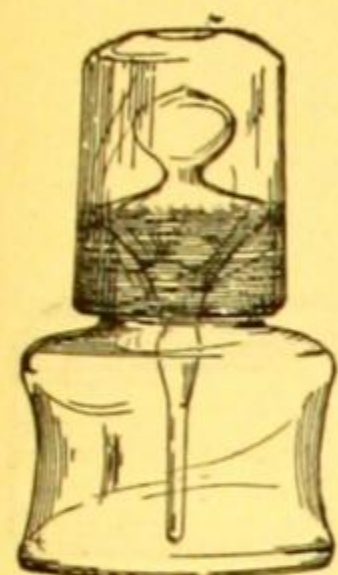
Capacity, cc	30	60	125	250	500	1000
Per dozen	2.25	2.40	3.10	3.90	5.10	7.10
33⅓% discount in case containing.....	864	720	432	288	144	72
Capacity, cc			2000	4000		8000
Each			1.25	3.00		5.25
33⅓% discount in case containing.....			48	24		12

BOTTLES

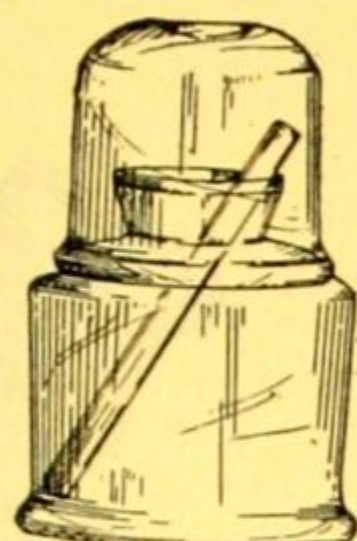
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



1588.	BOTTLES, tincture, flint glass, with reagent stopper.					
	Capacity, ounces	1	2	4	8	16
	Per dozen	\$2.05	2.25	2.75	3.35	4.70
	33 $\frac{1}{3}$ % discount in case containing	864	720	432	288	144
	Capacity, gallons				$\frac{1}{2}$	1
	Each				.90	2.50
	33 $\frac{1}{3}$ % discount in case containing				48	24
1590.	BOTTLES, tincture, of amber glass, with mushroom stopper.					
	Capacity, ounces	1	2	4	8	16
	Per dozen	2.05	2.25	2.75	3.35	4.70
	33 $\frac{1}{3}$ % discount in case containing	864	720	432	288	144
1592.	BOTTLES, narrow mouth, green glass, with vertical stopper, for acids.					
	Capacity	16 oz.	40 oz.	5 pint	1 gal.	2 gal.
	Each	.30	.50	.60	1.10	2.25
	33 $\frac{1}{3}$ % discount in case containing	72	48	36	24	12
1594.	BOTTLES, salt mouth, flint glass, mushroom stopper.					
	Capacity, ounces	1	2	4	8	16
	Per dozen	2.10	2.40	2.85	3.50	4.75
	33 $\frac{1}{3}$ % discount in case containing	864	720	432	288	144
	Capacity, gallons			$\frac{1}{2}$	1	2
	Each			1.00	2.75	5.00
	33 $\frac{1}{3}$ % discount in case containing			48	24	12
1596.	BOTTLES, salt mouth, flint glass, squat form, with flat glass stopper.					
	Capacity, cc	30	60	125	250	500
	Per dozen	2.40	2.60	3.50	4.00	5.20
	33 $\frac{1}{3}$ % discount in case containing	864	720	432	288	144
1598.	BOTTLES, wide mouth, hollow ground glass stopper, enabling spoon or spatula to be kept in bottle. Complete with horn spoon.					
	Capacity, ounces				2	4
	Each				.35	.70
	Per dozen				3.50	7.00
1610.	BOTTLES, Aspirator, of heavy glass, with tubulature at bottom.					
	No.	A	B	C	D	E
	Capacity, gallons	$\frac{1}{2}$	1	2	3	5
	Each	1.30	1.90	3.30	5.00	10.00
1612.	BOTTLES, Aspirator, of heavy glass, with glass stopper and glass stop-cock ground in tubulature.					
	Capacity, ounces			8	16	32
	Each			3.00	3.20	3.50
	Capacity, gallons	$\frac{1}{2}$	1	2	3	5
	Each	4.50	6.60	9.00	12.50	16.00
1614.	BOTTLES, Aspirator, of heavy glass, with narrow outlet for connecting rubber tubing.					
	Capacity, ounces		4	8	16	32
	Each		.80	.90	.95	1.20
	Capacity, gallons			$\frac{1}{2}$	1	2
	Each			1.40	2.50	3.50



No. 1618.



No. 1620.



No. 1622.



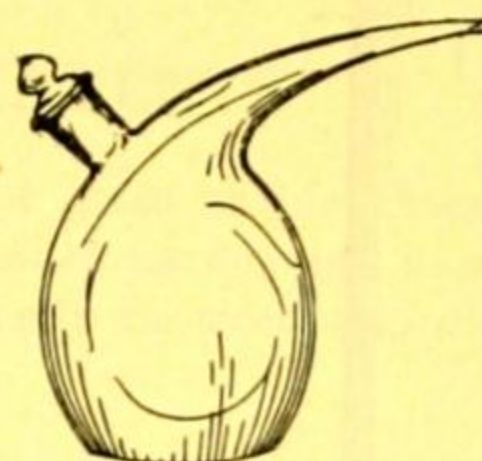
No. 1624.



No. 1634.



No. 1638.



No. 1640.



No. 1645.

BOTTLES FOR SPECIAL USES

1618. BOTTLE, Balsam, with glass cap, and loosely fitting glass dropper. Capacity, 30 cc.... \$0.50
1620. BOTTLE, Balsam, wide mouth, with glass rod and glass cap ground to fit against shoulder of bottle. Capacity, 60 cc..... .35
1622. BOTTLE, Dropping, with Barnes' pipette stopper, square shape. Capacity, 30 cc..... .10
20% discount in lots of 12.
1624. BOTTLES, Dropping, with ground in pipette, with rubber bulb.
Capacity, cc 30 60
Each40 .45
20% discount in lots of 12.
1634. BOTTLES, Dropping, "TK", with grooved flat glass stopper.
Capacity, cc 30 60 100
Each30 .35 .40
20% discount in lots of 144.
1638. BOTTLES, Dropping, "TK", with grooved vertical stopper.
Capacity, cc 30 60 100
Each25 .40 .45
20% discount in lots of 144.
1640. BOTTLE, Dropping, Schuster's, with ground-in glass stopper. Capacity, 30 cc..... .40
20% discount in lots of 12.
1641. BOTTLE, Dropping, Schuster's, without stopper. Capacity, 30 cc..... .20
20% discount in lots of 12.

BOTTLES, Gas Generating, see Gas Generators.

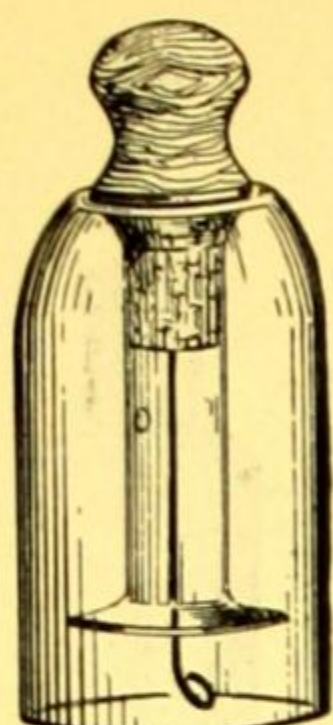
BOTTLES, Gas Washing, see Gas Washing Bottles.

1645. BOTTLES, Homeopathic Vials, short form.

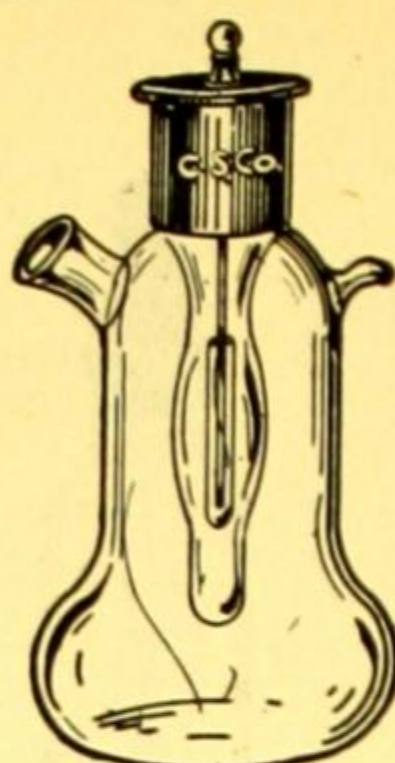
Capacity, drams	1	2	3	4	6	8
Dimensions, mm	42x14	58x16	64x19	68x20	80x22	83x24
To take cork stopper, No.....	2	3	4	4	5	6
Per gross	1.60	1.90	2.50	3.70	5.00	6.10

BOTTLES

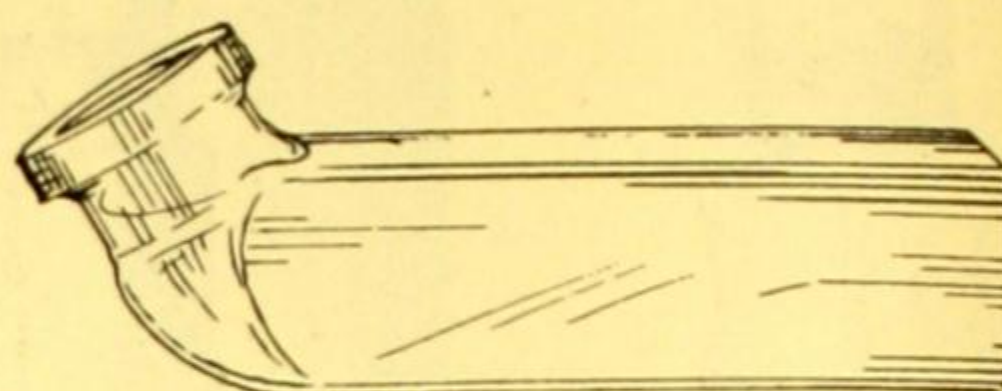
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



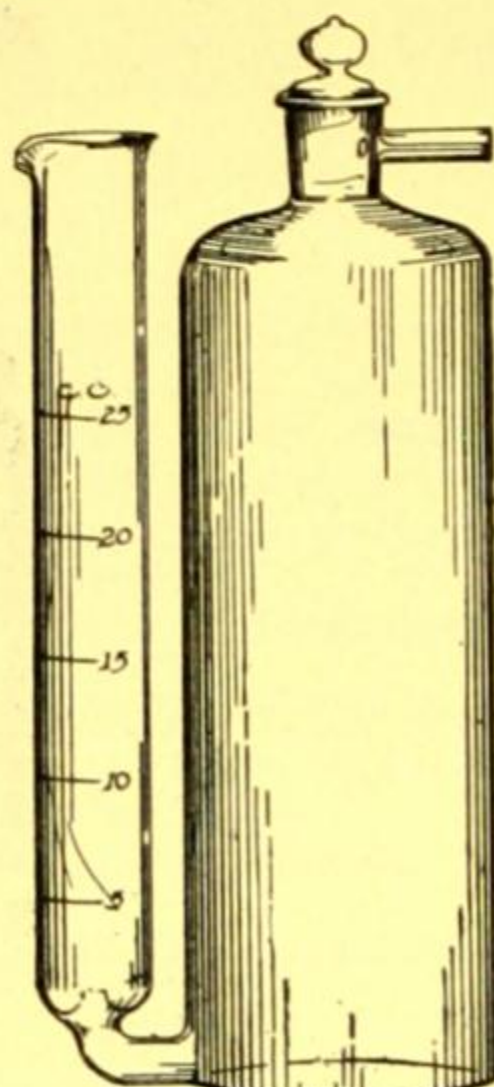
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No. 1651.



No. 1654.



No. 1658.

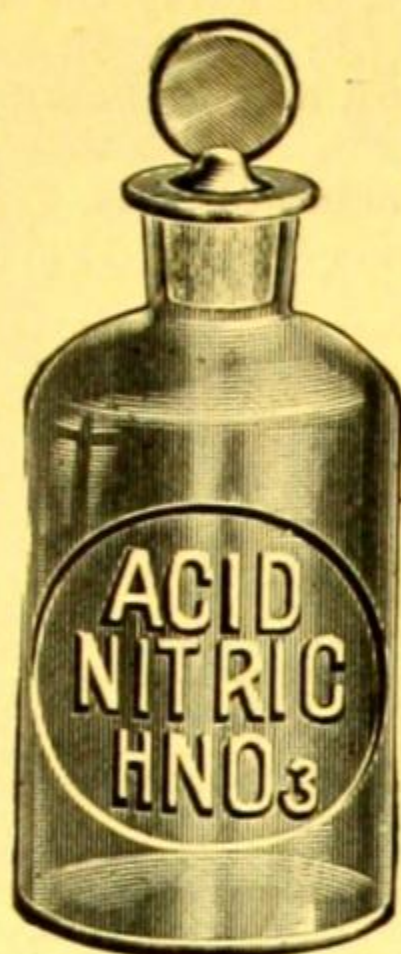


No. 1661.



No. 1666.

1648. BOTTLE, Immersion Oil, unspillable, with wooden stopper and wire dropper..... \$0.80
1651. BOTTLE, Immersion Oil and Dropping Combined, of glass with loose-fitted nickel-plated cover carrying pointed dropper. The small inner container is sealed into the outer jacket and is enlarged so that the small amount of oil in it will not run out when the bottle is turned over. The outer vessel is intended to contain alcohol, xylol or other solvent and the rate of flow through the small spout may be controlled by placing the finger on the larger opening. .90
10% discount in lots of 12.
1654. BOTTLES, Insect, bent neck.
Capacity, ounces 1/2 2
Dimensions, inches 3x3/4 5 1/4 x 1 1/4
Per dozen 1.00 1.85
20% discount in lots of 144.
1656. BOTTLE, Insect, cyanide, for collecting and killing, 4 ounce, ready for use..... .30
1658. BOTTLE, Measuring, designed by C. V. Bockius, of the Underwriters' Laboratories, for rapidly measuring and delivering a certain quantity of reagent where an approximate measurement is sufficient. An air opening is provided at the top for controlling the flow. Graduated to 25 cc in 5 cc divisions. Capacity of bottle, about 250 cc..... 5.00
- BOTTLES, Mixing, see Cylinders.
1561. BOTTLES, Oil Sample, clear flint glass, with rounded shoulder and concave bottom.
Capacity, ounces 2 4 8
Per dozen80 1.00 1.40
20% discount in lots of 144.
1663. BOTTLES, Oil Sample, 4 oz. capacity, same as No. 1661, but washed and corked..per dozen 1.40
20% discount in lots of 144.
1664. BOTTLES, Oil Sample, 4 ounce size, clear flint glass, with square shoulder and flat polished bottom. Cleaned and fitted with corks.....per dozen 3.00
20% discount in lots of 144.
1666. BOTTLES, Pressure, Lintner's, for digestion under pressure, with glass cap and rubber gasket, mounted in brass frame. Capacity, 125 cc..... 5.00



No. 1674.



No. 1690.

BOTTLES FOR REAGENTS

BOTTLES, Reagent, with raised letters blown in the glass with surfaces ground. These bottles are made according to a special formula and are much harder and more brilliant than the ordinary bottle glass and will show no free alkali. Only those bottles with labels listed below are manufactured.

PLEASE ORDER BY BOTTLE NUMBER.

1674. **BOTTLES, Reagent**, narrow mouth, 4 oz., height, 5 $\frac{1}{4}$ inches.....per dozen \$2.50
per gross 23.75

No.		No.	
3.	Acetic Acid ----- $\text{HC}_2\text{H}_3\text{O}_2$	24.	Magnesium Sulphate ----- MgSO_4
30.	Alcohol ----- $\text{C}_2\text{H}_5\text{OH}$	25.	Mercuric Chloride ----- HgCl_2
439.	Ammonium Acetate ----- $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	100.	Mercuric Potassium Iodide.
18.	Ammonium Carbonate ----- $(\text{NH}_4)_2\text{CO}_3$	86.	Mercurous Nitrate ----- HgNO_3
17.	Ammonium Chloride ----- NH_4Cl	415.	Methyl Alcohol ----- CH_3OH
15.	Ammonium Hydroxide ----- NH_4OH	411.	Methyl Orange.
82.	Ammonium Molybdate ----- $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$	88.	Nessler's Solution.
19.	Ammonium Oxalate ----- $(\text{NH}_4)_2\text{C}_2\text{O}_4$	5.	Nitric Acid ----- HNO_3
16.	Ammonium Sulphide (Amber). $(\text{NH}_4)_2\text{S}$	422.	Nitric Acid, Con ----- HNO_3
31.	Ammonium Sulphocyanide ----- NH_4CNS	430.	Nitric Acid, Dil ----- HNO_3
97.	Ammonium Sulphydrate ----- NH_4HS	93.	Oxalic Acid ----- $\text{H}_2\text{C}_2\text{O}_4$
33.	Barium Carbonate ----- BaCO_3	423.	Phenol ----- $\text{C}_6\text{H}_5\text{OH}$
20.	Barium Chloride ----- BaCl_2	412.	Phenolphthalein.
32.	Barium Hydroxide ----- $\text{Ba}(\text{OH})_2$	94.	Picric Acid ----- $\text{HC}_6\text{H}_2(\text{NO}_2)_3\text{O}$
401.	Barium Nitrate ----- $\text{Ba}(\text{NO}_3)_2$	37.	Platinic Chloride ----- PtCl_4
406.	Bromine Water.	8.	Potassium Carbonate ----- K_2CO_3
21.	Calcium Chloride ----- CaCl_2	96.	Potassium Chromate ----- K_2CrO_4
23.	Calcium Hydroxide ----- $\text{Ca}(\text{OH})_2$	432.	Potassium Cyanide ----- KCN
22.	Calcium Sulphate ----- CaSO_4	13.	Potassium Dichromate ----- $\text{K}_2\text{Cr}_2\text{O}_7$
83.	Carbon Disulphide ----- CS_2	11.	Potassium Ferricyanide ----- $\text{K}_3\text{Fe}(\text{CN})_6$
433.	Carbon Tetrachloride ----- CCl_4	6.	Potassium Ferrocyanide ----- $\text{K}_4\text{Fe}(\text{CN})_6$
407.	Chloroform ----- CHCl_3	12.	Potassium Hydroxide ----- KOH
408.	Cochineal.	10.	Potassium Iodide ----- KI
409.	Coralline.	9.	Potassium Sulphate ----- K_2SO_4
36.	Cupric Sulphate ----- CuSO_4	7.	Potassium Sulphocyanide ----- KCNS
421.	Dimethyl Glyoxime ----- $(\text{CH}_3)_2\text{C}_2(\text{NOH})_2$	26.	Silver Nitrate (Amber) ----- AgNO_3
35.	Ether ----- $(\text{C}_2\text{H}_5)_2\text{O}$	404.	Silver Sulphate ----- Ag_2SO_4
58.	Fehling's Solution.	60.	Sodium Acetate ----- $\text{NaC}_2\text{H}_3\text{O}_2$
29.	Ferric Chloride ----- Fe_2Cl_6	59.	Sodium Carbonate ----- Na_2CO_3
28.	Ferrous Sulphate ----- FeSO_4	416.	Sodium Cobaltic Nitrite.
2.	Hydrochloric Acid ----- HCl	61.	Sodium Hydroxide ----- NaOH
419.	Hydrochloric Acid, Con ----- HCl	14.	Sodium Phosphate ----- Na_2HPO_4
429.	Hydrochloric Acid, Dil ----- HCl	417.	Sodium Thiosulphate ----- $\text{Na}_2\text{S}_2\text{O}_3$
428.	Hydrogen Peroxide -----	81.	Stannous Chloride ----- SnCl_2
1.	Hydrogen Sulphide (Amber) ----- H_2S	4.	Sulphuric Acid ----- H_2SO_4
87.	Indigo Solution.	420.	Sulphuric Acid, Con ----- H_2SO_4
414.	Iodine Solution ----- $\text{I} + \text{KI}$	431.	Sulphuric Acid, Dil ----- H_2SO_4
27.	Lead Acetate ----- $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$	413.	Turmeric.
410.	Litmus.	56.	Uranium Acetate ----- $\text{UO}_2(\text{C}_2\text{H}_3\text{O}_2)_2$
90.	Magnesia Mitxure.	38.	Blank.
438.	Magnesium Chloride ----- MgCl_2		

BOTTLES

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.

1676. **BOTTLES, Reagent, 4 oz., set of 40 Reagent Bottles No. 1674, including the most common names used in the chemical laboratory: Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 59, 61, and 3 blanks.....per set \$8.30**
1678. **BOTTLES, Reagent, 4 oz., set of 24 according to Fresenius, including Nos. 2, 3, 4, 5, 6, 7, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 25, 26, 27, 29, 32, 36, 59 and 61.....per set 5.00**
1680. **BOTTLES, Reagent, 4 oz., set of 12, consisting of Nos. 1, 2, 3, 4, 5, 15, 16, 20, 23, 26, 27 and 61.per set 2.50**
1682. **BOTTLES, Reagent, narrow mouth, 8 oz., height, 6½ inches.....per dozen 3.20
per gross 30.40**

No.		No.	
131.	Acetic Acid ----- $\text{HC}_2\text{H}_3\text{O}_2$	152.	Lead Acetate ----- $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$
126.	Alcohol ----- $\text{C}_2\text{H}_5\text{OH}$	153.	Mercuric Chloride ----- HgCl_2
110.	Ammonium Carbonate ----- $(\text{NH}_4)_2\text{CO}_3$	103.	Nitric Acid, Con ----- HNO_3
109.	Ammonium Chloride ----- NH_4Cl	104.	Nitric Acid, Dil ----- HNO_3
108.	Ammonium Hydroxide ----- NH_4OH	171.	Potassium Carbonate ----- K_2CO_3
155.	Ammonium Molybdate ----- $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$	160.	Potassium Chromate ----- K_2CrO_4
130.	Ammonium Oxalate ----- $(\text{NH}_4)_2\text{C}_2\text{O}_4$	172.	Potassium Ferricyanide ----- $\text{K}_3\text{Fe}(\text{CN})_6$
158.	Ammonium Phosphate ----- $(\text{NH}_4)_2\text{HPO}_4$	173.	Potassium Ferrocyanide ----- $\text{K}_4\text{Fe}(\text{CN})_6$
122.	Ammonium Sulphide (Amber) ----- $(\text{NH}_4)_2\text{S}$	150.	Potassium Hydroxide ----- KOH
114.	Barium Chloride ----- BaCl_2	145.	Silver Nitrate (Amber) ----- AgNO_3
151.	Calcium Hydroxide ----- $\text{Ca}(\text{OH})_2$	112.	Sodium Carbonate ----- Na_2CO_3
159.	Ether ----- $(\text{C}_2\text{H}_5)_2\text{O}$	111.	Sodium Hydroxide ----- NaOH
154.	Ferrous Sulphate ----- FeSO_4	129.	Sodium Phosphate ----- Na_2HPO_4
105.	Hydrochloric Acid, Con ----- HCl	156.	Stannous Chloride ----- SnCl_2
106.	Hydrochloric Acid, Dil ----- HCl	101.	Sulphuric Acid, Con ----- H_2SO_4
107.	Hydrogen Sulphide (Amber) ----- H_2S	102.	Sulphuric Acid, Dil ----- H_2SO_4
		116.	Blank.

1684. **BOTTLES, Reagent, narrow mouth, 16 oz. (pint), height, 7¾ inches.....per dozen 4.50
per gross 42.75**

No.		No.	
237.	Acetic Acid ----- $\text{HC}_2\text{H}_3\text{O}_2$	231.	Hydrochloric Acid, Dil ----- HCl
239.	Alcohol ----- $\text{C}_2\text{H}_5\text{OH}$	226.	Hydrodisodic Phosphate ----- Na_2HPO_4
241.	Ammonium Acetate ----- $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$	216.	Nitric Acid ----- HNO_3
235.	Ammonium Carbonate ----- $(\text{NH}_4)_2\text{CO}_3$	219.	Nitric Acid, Con ----- HNO_3
234.	Ammonium Chloride ----- NH_4Cl	232.	Nitric Acid, Dil ----- HNO_3
204.	Ammonium Hydroxide ----- NH_4OH	259.	Potassium Bichromate ----- $\text{K}_2\text{Cr}_2\text{O}_7$
227.	Ammonium Hydroxide, Dil ----- $\text{NH}_4\text{OH} + \text{Aq}$	238.	Potassium Chromate ----- K_2CrO_4
258.	Ammonium Oxalate ----- $(\text{NH}_4)_2\text{C}_2\text{O}_4$	221.	Potassium Hydroxide ----- KOH
236.	Ammonium Sulphide (Amber) ----- $(\text{NH}_4)_2\text{S}$	240.	Silver Nitrate (Amber) ----- AgNO_3
218.	Barium Chloride ----- BaCl_2	260.	Sodium Carbonate ----- Na_2CO_3
223.	Calcium Hydroxide ----- $\text{Ca}(\text{OH})_2$	233.	Sodium Hydroxide ----- NaOH
225.	Calcium Sulphate ----- CaSO_4	228.	Sodium Hydroxide, Dil ----- $\text{NaOH} + \text{Aq}$
230.	Ether ----- $(\text{C}_2\text{H}_5)_2\text{O}$	215.	Sulphuric Acid ----- H_2SO_4
224.	Ferrous Sulphate ----- FeSO_4	220.	Sulphuric Acid, Con ----- H_2SO_4
217.	Hydrochloric Acid ----- HCl	242.	Sulphuric Acid, Dil ----- H_2SO_4
222.	Hydrochloric Acid, Con ----- HCl	211.	Blank.

1686. **BOTTLES, Reagent, narrow mouth, 32 oz. (quart), height, 9½ inches.....per dozen 6.50**

No.		No.	
512.	Ammonium Hydroxide ----- NH_4OH	504.	Nitric Acid, Dil ----- HNO_3
505.	Hydrochloric Acid, Con ----- HCl	501.	Sulphuric Acid, Con ----- H_2SO_4
506.	Hydrochloric Acid, Dil ----- HCl	502.	Sulphuric Acid, Dil ----- H_2SO_4
503.	Nitric Acid, Con ----- HNO_3	511.	Blank.

1690. **BOTTLES, Reagent, wide mouth, 4 oz., height, 4¾ inches.....per dozen 2.80**

No.		No.	
314.	Ammonium Sulphate ----- $(\text{NH}_4)_2\text{SO}_4$	313.	Sod. Am. Hyd. Phos ----- $(\text{NH}_4)\text{HPO}_4 + 4\text{H}_2\text{O}$
304.	Borax ----- $\text{Na}_2\text{B}_4\text{O}_7$	301.	Sodium Carbonate ----- Na_2CO_3
305.	Ferrous Sulphate ----- FeSO_4	312.	Test Paper.
303.	Potassium Cyanide ----- KCN	307.	Blank.
302.	Potassium Nitrate ----- KNO_3		

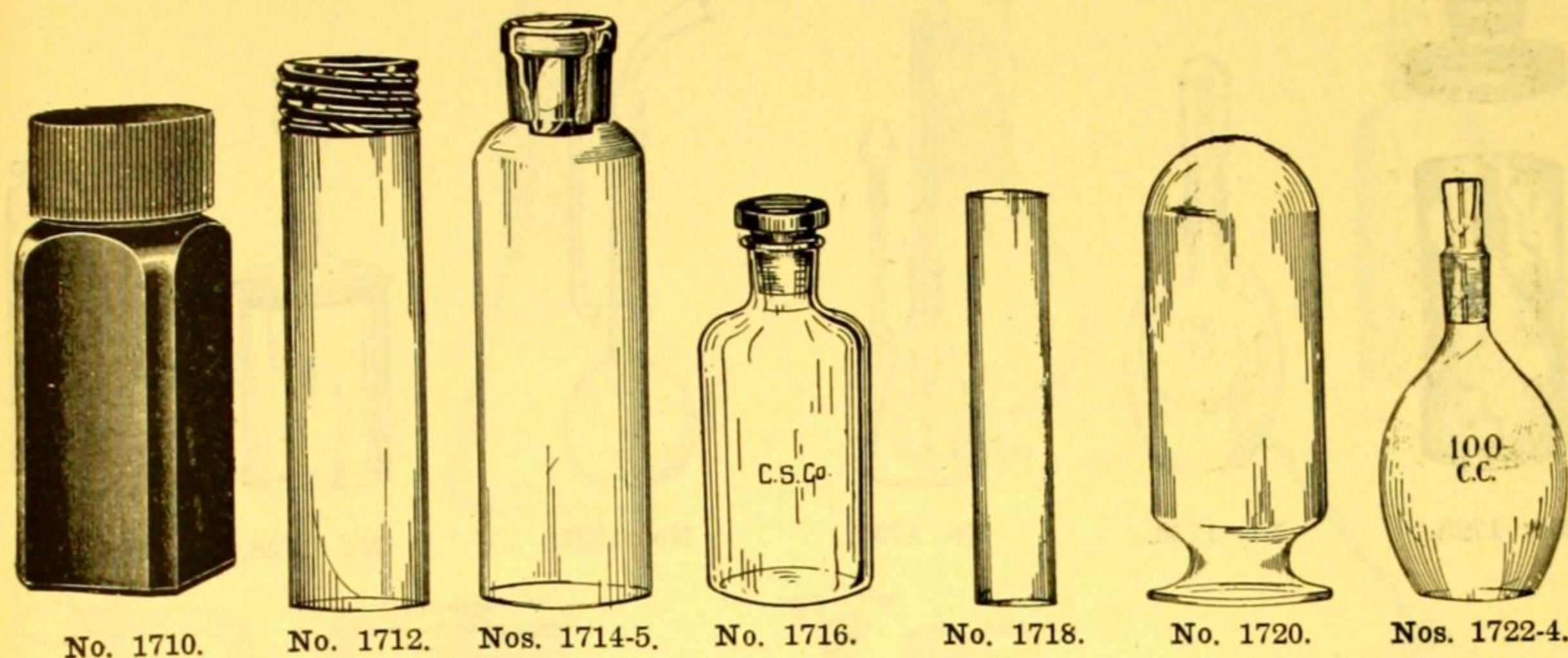
1691. **BOTTLES, Reagent, narrow mouth, with special labels. Bottles are made in the same molds as the labeled Reagent bottles Nos. 1674 to 1686 inclusive, but with special wheel-cut labels as desired. As these bottles are only made to order, about two weeks' time is required for delivery.**

Capacity, ounces	4	8	16	32
Per dozen	5.35	6.00	8.25	10.25

1692. **BOTTLES, Reagent, wide mouth, capacity 4 ounces, with special labels. Identical with No. 1690 but with special wheel-cut labels as desired. As these bottles are only made to order, about two weeks' time is required for delivery.....per dozen 5.65**

1694. **CAPS for Reagent bottles.**

For bottles of capacity, ounces	4	8	16	32
Height inside, millimeters	58	64	65	70
Diameter inside, millimeters	33	40	45	50
Per dozen	2.20	2.30	2.40	2.50



1710. **BOTTLES, Hard Rubber, square, with tight screw cap, for hydrofluoric acid.**
 Capacity, ounces 4 8 16
 Each \$1.25 1.70 2.10
1712. **BOTTLES, Screw-Cap Vials, with cork-lined aluminum screw cap.**
 Capacity, drams 1 2 4 8 12
 Dimensions, inches $1\frac{3}{4} \times \frac{5}{8}$ $2\frac{3}{8} \times \frac{5}{8}$ $2\frac{5}{8} \times \frac{3}{4}$ $3\frac{1}{2} \times \frac{7}{8}$ $5\frac{1}{2} \times \frac{7}{8}$
 Per dozen30 .40 .55 .90 1.20
 Per gross 3.30 4.00 5.60 9.00 11.80
1714. **BOTTLES, Serum, or Vaccine, of amber glass. All capacities have same size neck, taking the same stopper.**
 Capacity, cc 1 to 2 5 10
 Per gross 2.10 3.50 5.30
1715. **RUBBER STOPPERS, special form for Serum Bottles No. 1714.....per gross 1.80**
1716. **BOTTLES, Serum or Vaccine, made of a glass with low alkali content. Furnished with special red rubber stoppers perforated almost to the top so that a hypodermic needle may be readily inserted. The small opening thus produced closes after the needle is removed so that there is no danger of contamination of the liquid remaining in the bottle.**
 Size, cc 30 60
 Per dozen 1.90 2.00
 20% discount in lots of 144.
1717. **RUBBER STOPPERS, special form for Serum Bottles No. 1716.....per dozen .65**
 20% discount in lots of 144.
1718. **BOTTLES, Shell Vials, round, straight wall.**
- | No. | A | B | C | D | E |
|--------------------------|------|------|------|------|------|
| Capacity, drams | 1 | 2 | 3 | 4 | 8 |
| Capacity, cc, about..... | 4 | 7 | 11 | 14 | 28 |
| Takes cork No. | 3 | 3 | 4 | 5 | 10 |
| Per dozen | .10 | .10 | .15 | .25 | .40 |
| Per gross | 1.10 | 1.10 | 1.60 | 2.40 | 4.00 |
1720. **BOTTLES, Show, Inverted, for storing and exhibiting sample grains, chemicals, etc.**
- | | $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{1}{2}$ | 1 | 2 | 4 | 8 |
|------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Capacity, pints | $3\frac{3}{4}$ | $4\frac{3}{8}$ | 6 | $7\frac{3}{4}$ | 9 | 11 | 14 |
| Height, inches | $1\frac{1}{2}$ | 2 | $2\frac{1}{2}$ | $2\frac{3}{4}$ | $3\frac{5}{8}$ | $4\frac{1}{4}$ | $5\frac{3}{4}$ |
| Diameter, inches | .28 | .32 | .40 | .55 | .70 | 1.05 | 2.10 |
| Each | 2.80 | 3.20 | 4.00 | 5.50 | 7.00 | 10.50 | 21.00 |
| Per dozen | | | | | | | |
1722. **BOTTLES, Specific Gravity, unadjusted, with perforated stopper.**
 Capacity, approx., cc..... 25 50 100
 Each60 .80 .90
1724. **BOTTLES, Specific Gravity, accurately adjusted at 20°C., with perforated stopper.**
 Capacity, cc..... 10 25 50 100
 Each90 1.10 1.50 1.80

BOTTLES

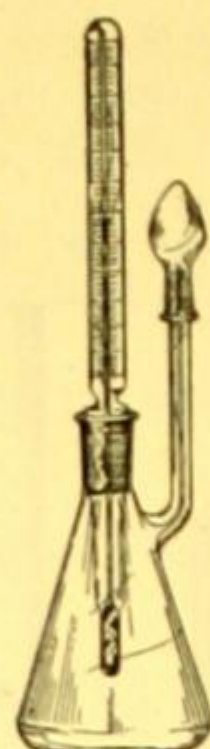
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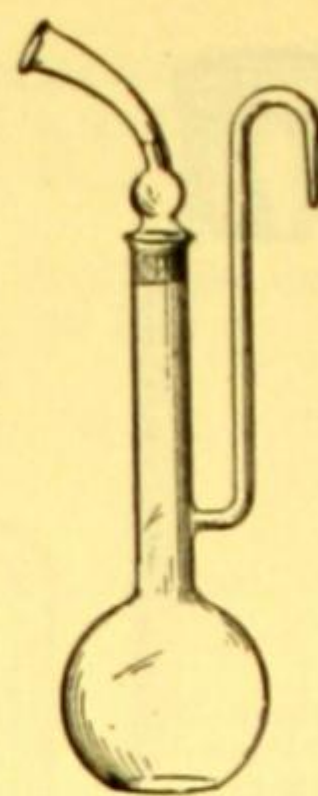
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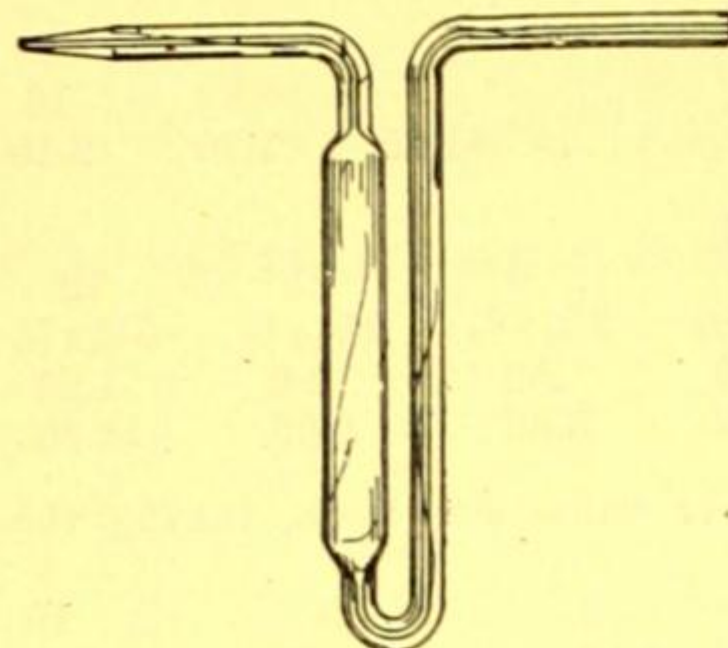
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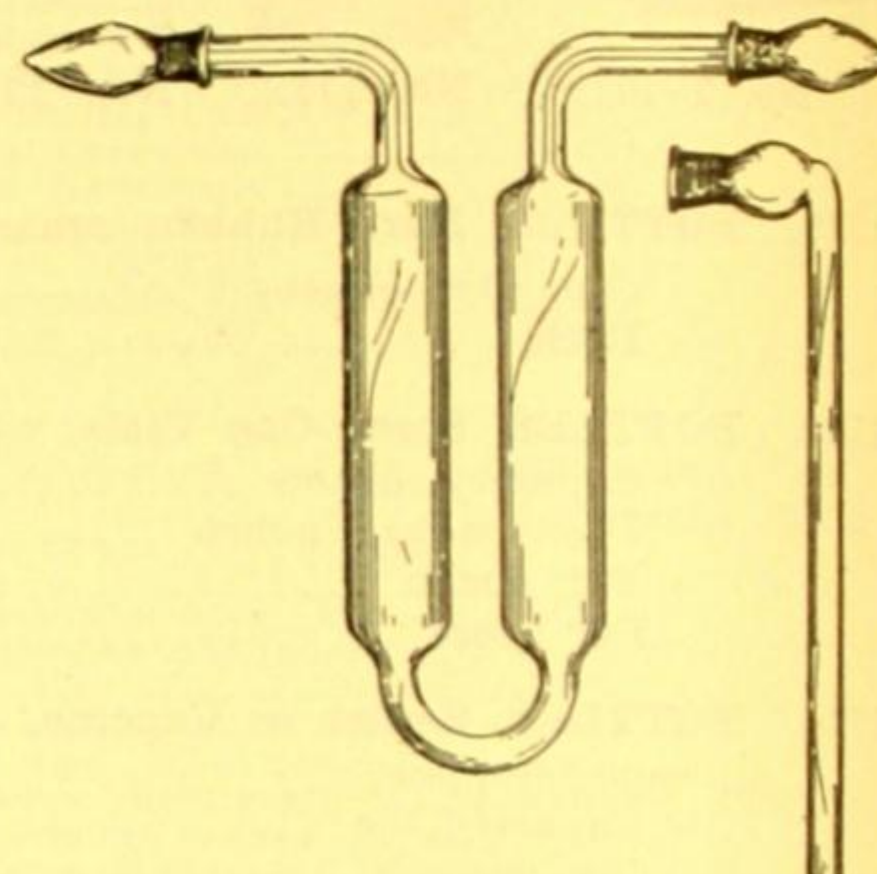
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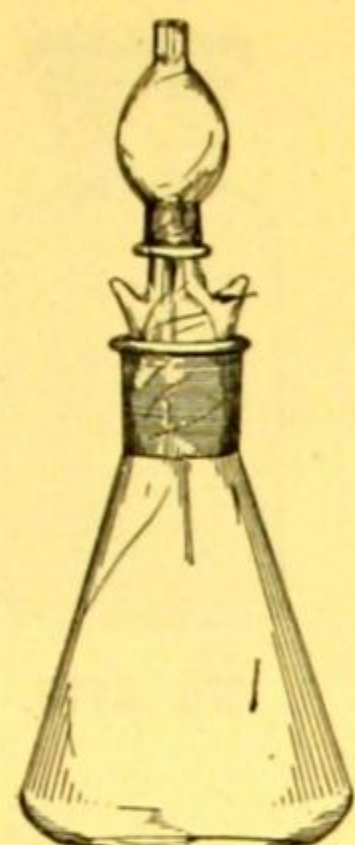


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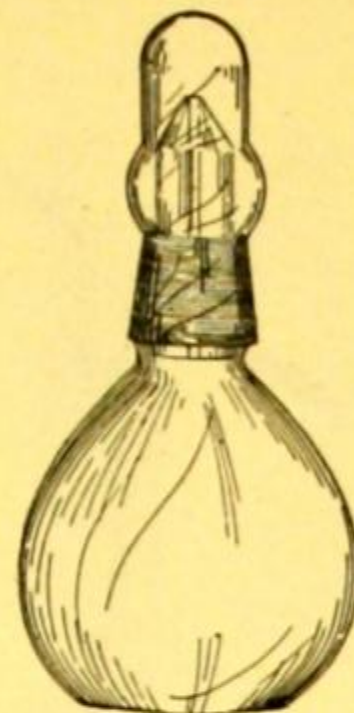
1725. **BOTTLES, Specific Gravity**, same as No. 1724, in tin case with counterpoise.
Capacity, cc..... 25 50
Each \$3.00 3.50
1726. **BOTTLE, Specific Gravity, Barrett Type**, 50 cc capacity, for specific gravity of tar and pitch. (See Journal of Industrial & Engineering Chemistry, Vol. V, No. 3, for March 1913, page 195). 1.60
1728. **BOTTLES, Specific Gravity, Boot's**, double walled, with vacuum, maintaining constant temperature inside. With perforated stopper and ground cap.
Capacity, cc..... 25 50
Each 3.20 4.00
1730. **BOTTLES, Specific Gravity, Geissler's**, with thermometer reading from 8° to 40°C. in 1/5° ground in central neck, and cap ground on side neck.
Capacity, cc..... 25 50
Each 3.30 3.70
1732. **BOTTLE, Specific Gravity, Hogarth's**, specially recommended by the United States Bureau of Mines for coal and coke. Widely used for specific gravity of iron ores. Capacity, about 100 cc 2.20
1734. **BOTTLE, Specific Gravity, Hubbard's**, for asphalts, bitumens, and dense oils. With glass stopper concave on under side, with opening 1.6 mm to permit escape of air. Height, 70 mm; diameter, 22 mm; capacity, about 24 cc. 1.50
1736. **BOTTLE, Specific Gravity, Le Chatelier's**, for cement, special form recommended by the United States Bureau of Standards and the American Society for Testing Materials. (See Circular No. 33 of the United States Bureau of Standards and Standard Specifications for 1921 of the American Society for Testing Materials, No. C 9-21) 5.10
1737. **BOTTLE, Specific Gravity**, same as No. 1736, but standardized by the United States Bureau of Standards, with certificate. 9.50
1740. **BOTTLE, Specific Gravity, Nicol's Tube**, for liquids70
1748. **BOTTLE, Specific Gravity, Sprengel's**, with ground-on suction tube, and ground caps. Height over all, about 100 mm; diameter of tubes, 14 mm. 1.50



No. 1750.



No. 1752.



No. 1754.



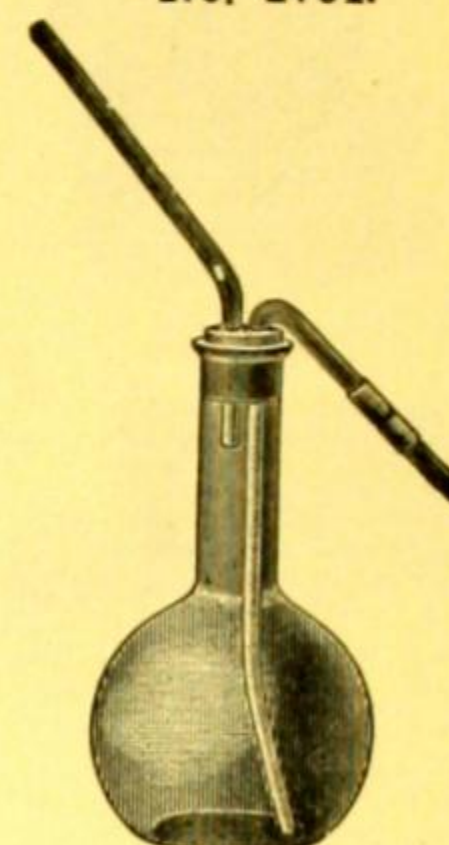
No. 1764.



No. 1756.



No. 1758.



No. 1766.

1750. **BOTTLE, Specific Gravity, Walker's**, for very fluid liquids, as described in Bulletin 109 of the Bureau of Chemistry, United States Department of Agriculture. Capacity, about 20 cc. \$2.50
1752. **BOTTLE, Specific Gravity, Walker's**, same as No. 1750, for very viscous liquids. Capacity, about 30 cc. 2.90

1754. **SPECIFIC GRAVITY BOTTLE, Weld's Precision**. For the precise determination of the density of liquids and salt solutions as designed by Prof. Leroy D. Weld of Coe College. With ground-on cap and pointed stopper. Especially valuable for use with highly volatile liquids since the ground-on cap prevents evaporation. The pointed stopper prevents the formation of an overflow drop. With this bottle weighings can be made to an accuracy of 1/1000 of 1 per cent., or with twice the accuracy of those made with a flat stoppered bottle similarly capped. Capacity, about 25 cc. 2.00

1756. **BOTTLES, Specimen or Sample**, of glass, round, with cork-lined aluminum screw-caps.
- | | | | | | |
|------------------|-------|-------|-------|---------|-------|
| Capacity, ounces | 1 | 2 | 4 | 8 | 16 |
| Height, inches | 3 1/8 | 3 3/4 | 4 3/4 | 4 11/16 | 5 3/4 |
| Diameter, inches | 1 1/8 | 1 1/2 | 1 7/8 | 2 1/2 | 3 1/8 |
| Per dozen | 1.00 | 1.10 | 1.35 | 1.80 | 2.70 |

15% discount in lots of 144.

1758. **BOTTLES, Specimen or Sample**, of glass, square, with cork-lined aluminum screw-caps.
- | | | | | |
|------------------|-------|---------|---------|--------|
| Capacity, ounces | 1 | 2 | 4 | 8 |
| Height, inches | 2 1/2 | 3 13/32 | 4 1/2 | 5 9/16 |
| Side, inches | 1 3/8 | 1 1/2 | 1 13/16 | 2 1/8 |
| Per dozen | 1.00 | 1.10 | 1.35 | 1.60 |

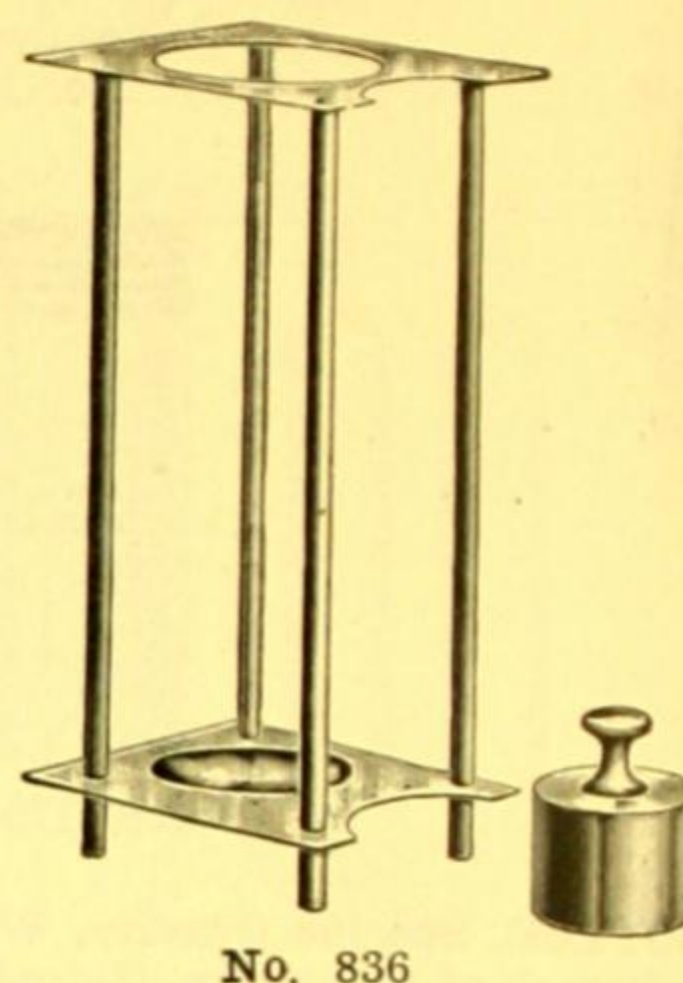
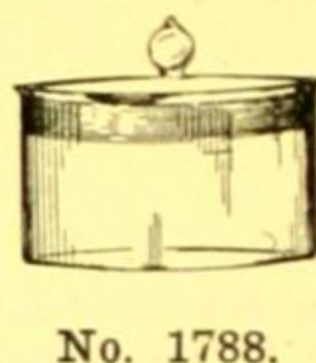
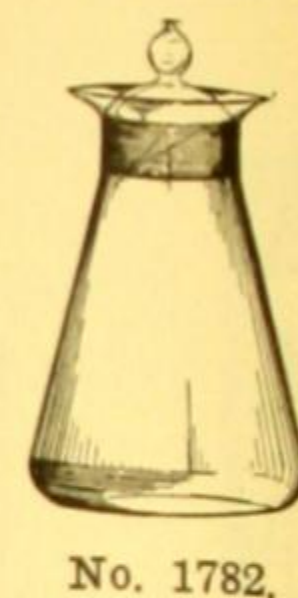
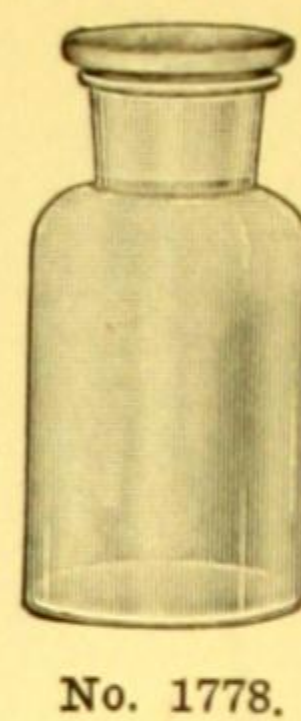
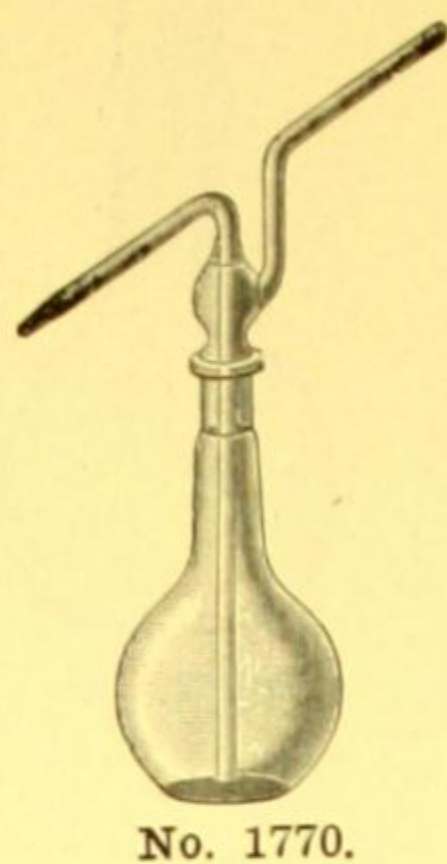
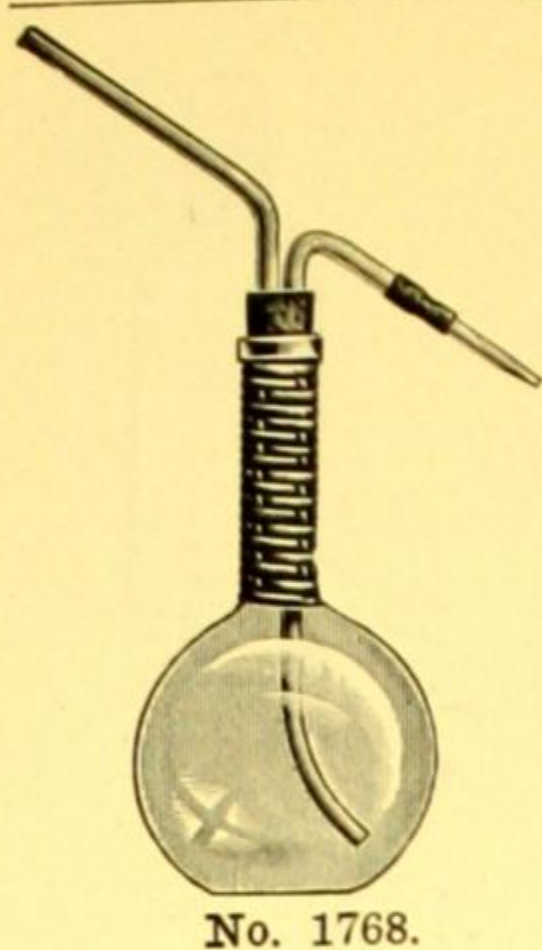
15% discount in lots of 144.

For other **SAMPLE BOTTLES and JARS**, see Jars, Sample; also Boxes, Sample.**BOTTLES, Sputum**, see No. 2757.**BOTTLES, Vacuum or Thermos**, see Vacuum Bottles.**BOTTLES, Sterilizer**, see No. 12391.

1764. **BOTTLES, Volatile Liquid**, glass stoppered with ground-on glass cap.
- | | | |
|------------------|------|------|
| Capacity, ounces | 8 | 16 |
| Each | 1.20 | 1.50 |
1766. **BOTTLES, Washing**, of Pyrex glass, with heavy neck, fitted with rubber stopper and movable delivery tube. Will stand more severe usage than those made of ordinary glass on account of resistance to temperature changes and mechanical strains, and are therefore more economical to buy.
- | | | |
|--------------|-----|------|
| Capacity, cc | 500 | 1000 |
| Each | .70 | .90 |

BOTTLES

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



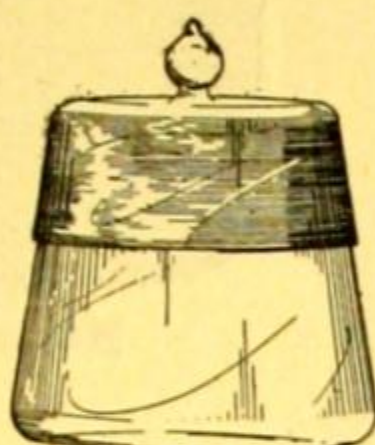
1768. BOTTLES, Washing, of Pyrex glass, with neck covered with wicker, for use with hot water.
Capacity, ounces 16 32
Each \$1.30 1.50
1770. BOTTLES, Washing, all of glass, with ground connections, for ether.
Capacity, ounces 8 16 32
Each80 1.10 1.30
- BOTTLES, Gas Washing, see Gas Washing Bottles.
1778. BOTTLES, Water Sample, 2 ounce capacity, with flat ground-in stopper. Both stopper and bottle may be obtained numbered serially. In ordering, specify plain or numbered bottles, and if the latter, state the series of numbers desired.
No. A B
Style plain numbered
Each20 .36
Per dozen 2.15 3.90
- BOTTLES, Water, of stoneware, see Jars, Stoneware.
1782. BOTTLES, Weighing, conical form, very light, ground-in glass stoppers.
Capacity, cc. 15 30 60
Each50 .55 .65
1784. BOTTLES, Weighing, high form, flat bottom, without neck, ground-in glass stoppers.
No. A C
Height, mm 50 80
Diameter, mm. 15 15
Each35 .40
1786. BOTTLES, Weighing, low form, flat bottom, without neck, ground-in glass stoppers.
No. A B D E G
Height, mm. 40 50 50 60 80
Diameter, mm. 25 25 40 30 40
Each35 .45 .60 .50 .80
1788. BOTTLES, Weighing, extra wide, flat bottom, without neck, ground-in glass stoppers.
No. A B C
Height, mm. 30 30 30
Diameter, mm. 50 60 70
Each 1.20 1.50 2.00
836. BALANCE WEIGHING TUBE SUPPORT, nickel-plated, for horizontal or vertical use.. 3.00



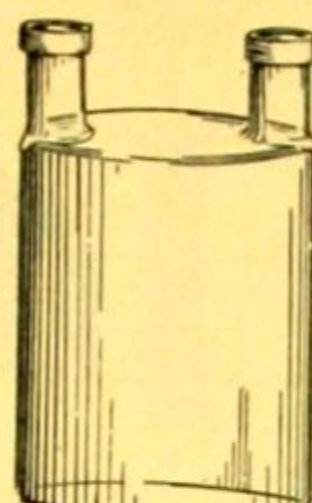
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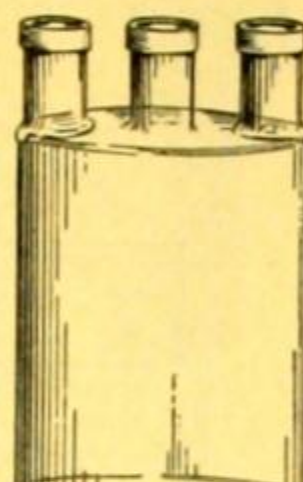
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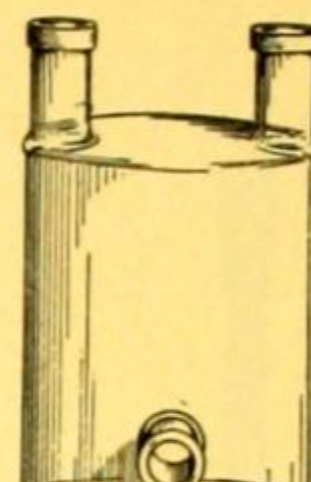
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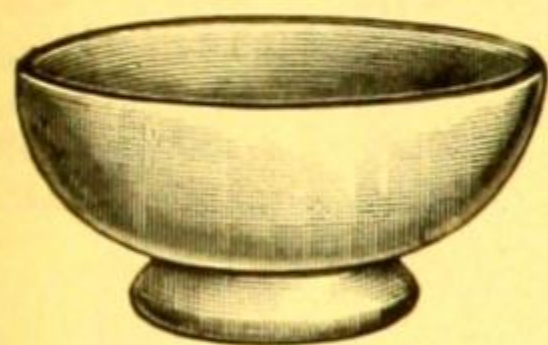
No. 1798.



No. 1800.



No. 1802.



No. 1814.



No. 1808.



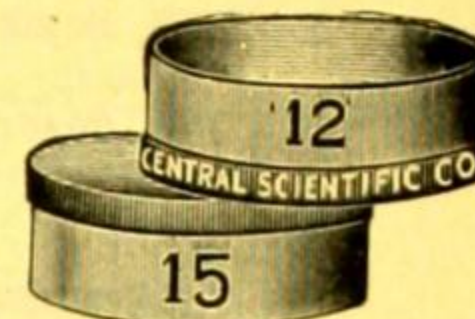
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No. 1817.



No. 1820.

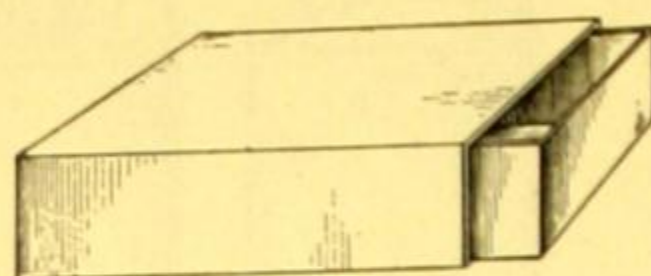


No. 1821.

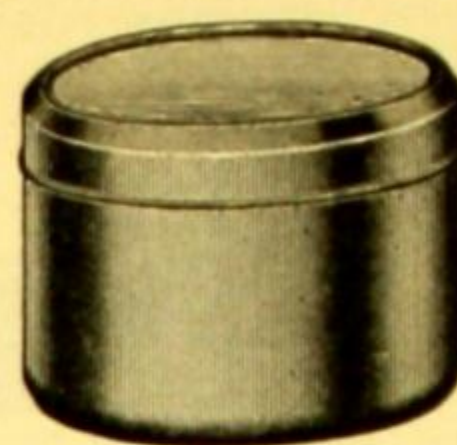
1792. **BOTTLE**, Weighing, Parr's, with cover ground outside, as used in coal analysis. Diameter 25 mm; height, 20 mm. \$0.60
1794. **BOTTLE**, Weighing Pipette, Grethen's Form, with glass stop-cock, for fuming acids; capacity, 2 cc 2.20
1796. **BOTTLE**, Weighing Pipette, Lunge's, with two stop-cocks, for fuming acids, etc. Capacity, about 15 cc. 3.00
1798. **BOTTLES**, Woulff's, of heavy glass, with two necks.
Capacity, cc 125 250 500 1000 2000 4000
Each 1.20 1.30 1.50 2.00 2.90 4.00
1800. **BOTTLES**, Woulff's, of heavy glass, with three necks.
Each 1.50 1.60 1.80 2.50 3.65
1802. **BOTTLES**, Woulff's, of heavy glass, with two necks and tubulature at bottom.
Capacity, cc 250 500 1000 2000
Each 2.00 2.10 2.60 3.30
1808. **BOTTLE REST**, Hard Rubber, for use under acid bottles, etc., for protecting table tops. Diameter inside, 3 $\frac{3}{4}$ inches. Will take bottles up to 32 ounce or 1 liter.30
1814. **BOWL**, Porcelain, so-called pint size. Used in washing out gluten in flour analysis.40
1816. **BOXES**, Aluminum, with aluminum screw top, 2 $\frac{3}{8}$ inches in diameter by 2 $\frac{1}{2}$ inches high.
Each75
1817. **BOXES**, Aluminum, same as No. 1816, but with box and cover numbered. In ordering state what numbers are desired. each .85
1820. **BOXES**, Aluminum, with aluminum top. The diameter of these boxes is uniform so that the cover fits the bottom of the box, making it possible to keep box and cover together while the box is open.
No. A B C
Diameter, inches 2 2 $\frac{1}{2}$ 3 $\frac{1}{2}$
Height, inches $\frac{7}{8}$ 1 $\frac{3}{4}$ 2
Each25 .40 .60
1821. **BOXES**, Aluminum, same as No. 1820, but with box and cover numbered. In ordering state what numbers are desired.
No. A B C
Diameter, inches 2 2 $\frac{1}{2}$ 3 $\frac{1}{2}$
Height, inches $\frac{7}{8}$ 1 $\frac{3}{4}$ 2
Each35 .50 .70
- BOXES**, Glass, see Jars, Sample.

BOXES

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 1826.



No. 1828.

1826. **BOXES, Pasteboard**, rectangular, slide form, white.

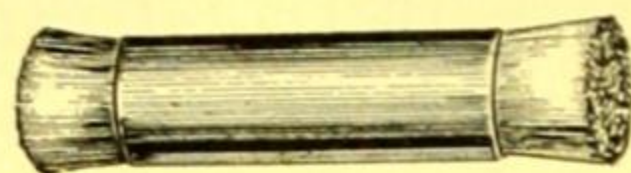
	A	B	C
No.	25 ¹ / ₁₆	29 ¹ / ₁₆	23 ¹ / ₄
Length, inches	1 ³ / ₈	1 ⁵ / ₈	11 ⁵ / ₁₆
Width, inches	11 ¹ / ₁₆	13 ¹ / ₁₆	15 ¹ / ₁₆
Depth, inches	\$0.26	.30	.38
Per dozen	2.60	3.60	3.80
Per gross			

BOXES, Slide, see Slide Boxes.**BOXES, Soil Sample**, see Soil Analysis Apparatus.

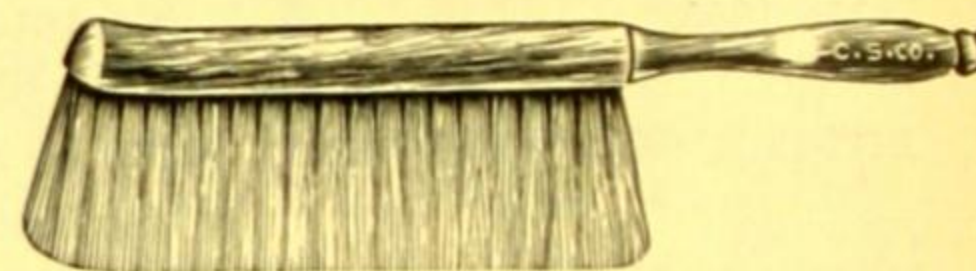
1828. **BOXES, Seamless Tin**, round, very convenient for samples. Widely used in asphalt laboratories.

Capacity, ounces	1/2	1	2	4	8	16	24
Per dozen	.20	.25	.40	.55	.80	1.30	1.70

10% discount in lots of 144.



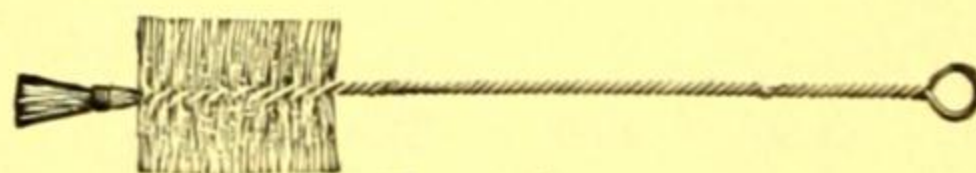
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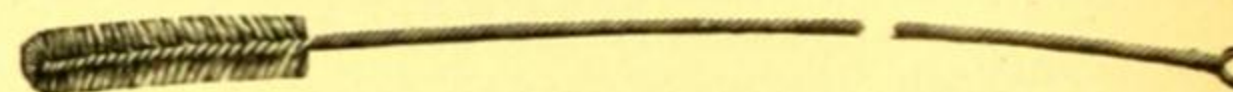
No. 1840.



No. 1834.



No. 1836.



No. 1838.

BRUSHES

1464. **BRUSH, Assay or Bead Brush**, of bristle, for lead buttons. 1.00

1834. **BRUSH, Beaker, Cylinder or Funnel**, with wood handle and black bristles. Length of bristle part, 3 inches; diameter, 2 inches; total length, 11¹/₂ inches.22

10% discount in lots of 12.

25% discount in lots of 144.

1836. **BRUSHES, Bottle**, bristle end, brass wire, white bristles.

	A	B
No.	12	20
Total length, inches	4	5 ¹ / ₂
Length of brush part, inches	2 ¹ / ₄	2 ³ / ₈
Diameter of brush part, inches	.20	.25
Each		

10% discount in lots of 12.

25% discount in lots of 144.

1838. **BRUSHES, Burette**, tinned wire, white bristles. No.

	A	B
For burettes, cc.	10 & 25	50 & 100
Total length, inches	24	36
Length of bristle part, inches	3	3 ¹ / ₄
Diameter of bristle part, inches	1/2	3/4
Each	.12	.15

10% discount in lots of 12.

25% discount in lots of 144.

1840. **BRUSH, Counter Dusting**, wooden handle, five rows, unbleached bristles. Length of bristle part, 8 inches; width, 2¹/₂ inches; total length, 13³/₈ inches.65

10% discount in lots of 12.



No. 1844.



No. 1848.

No. 1850.
No. 1872.

Nos. 1856-8.



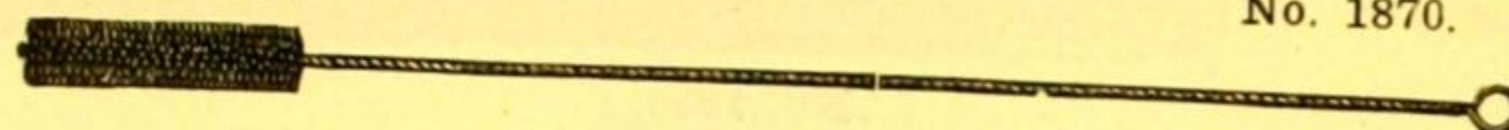
No. 1860.



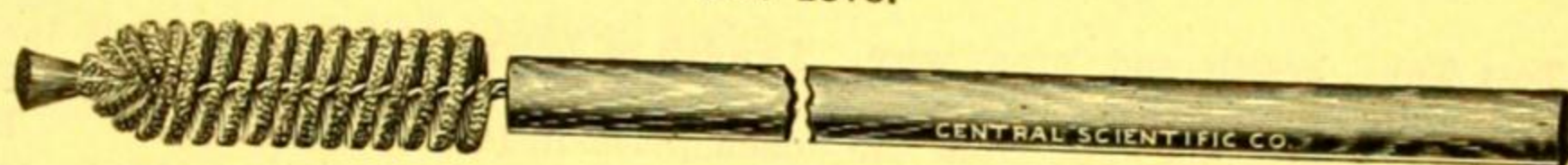
No. 1866.



No. 1870.



No. 1878.

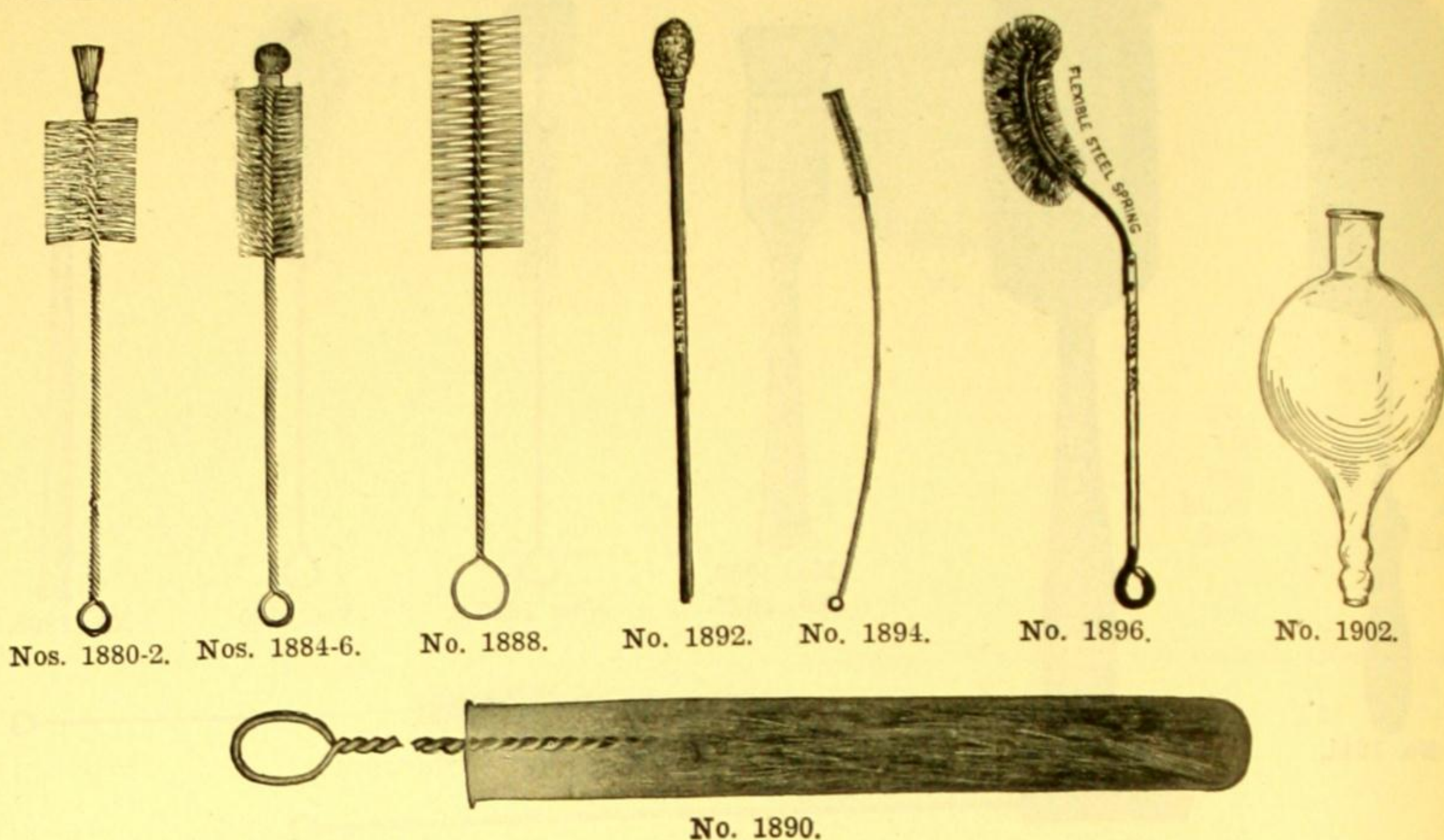


No. 1876.

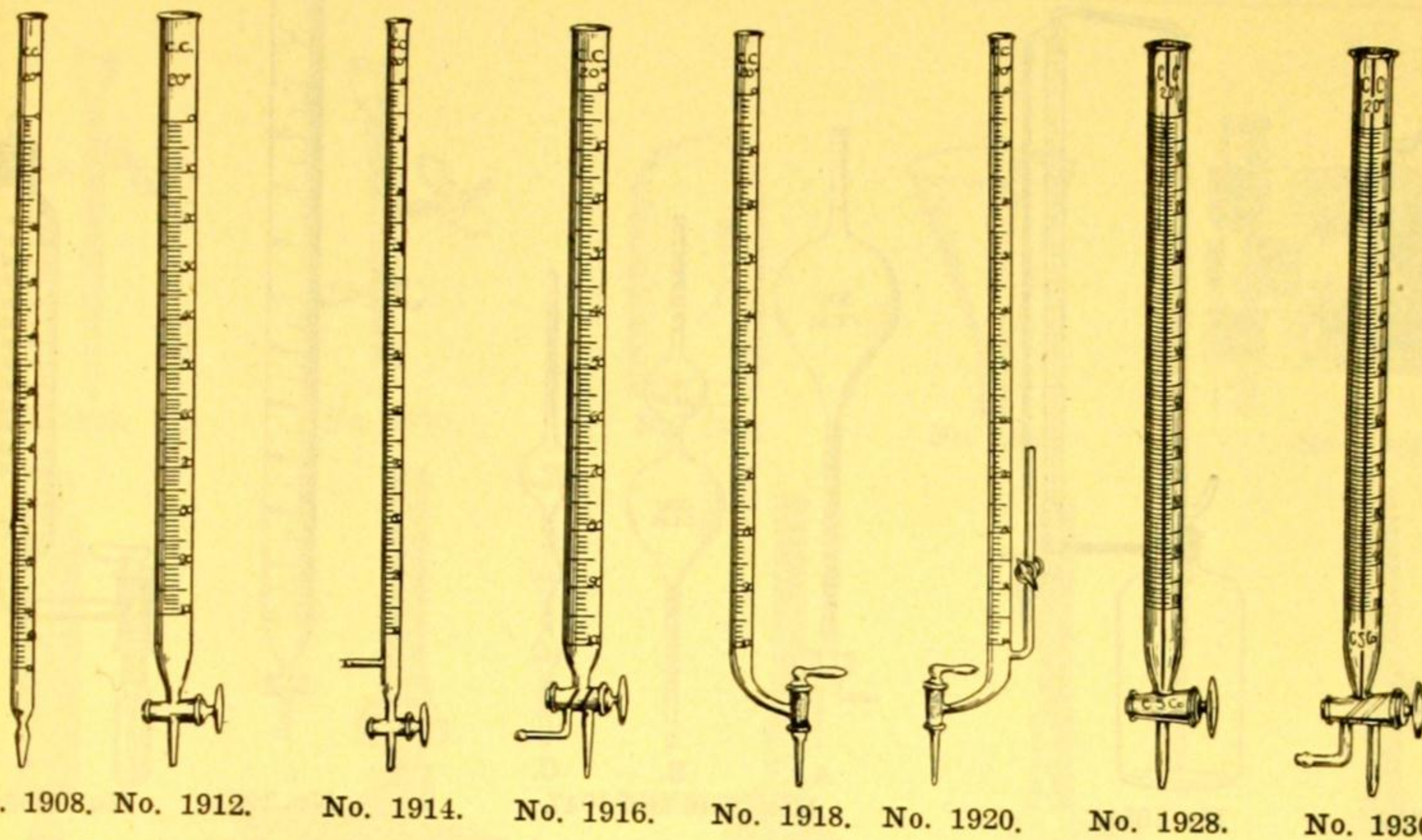
1844. BRUSH, Cylinder or Jar, with wooden handle and black bristles. Length of bristle part, $4\frac{1}{2}$ inches; diameter, $2\frac{1}{4}$ inches; total length, 12 inches \$0.30
1848. BRUSH, Cylinder or Jar, with wooden handle and four rows of black and white bristles, with two tufts set at angle for reaching corners of large bottles, cylinders and jars. Length of bristle part, $4\frac{1}{2}$ inches; diameter, $2\frac{1}{2}$ inches; length over all, 12 inches..... .50
1850. BRUSH, Dusting, flat for ore plates, etc; bristles 2 inches in length. These bristles are excellent grade with long, cut bristles set in rubber, and may be used for shellac, lacquer, varnish, etc. Width of bristle part, inches..... 1 2
- Each24 .42
- 10% discount in lots of 12 on Nos. 1844, 1848 and 1850.
1856. BRUSHES, Milk Bottle, for bottles with necks not less than $\frac{3}{16}$ inch in diameter. Each .09
- 20% discount from dozen price in lots of 144. Per dozen .90
1858. BRUSHES, Milk Bottle, for bottles with neck not less than $\frac{1}{4}$ inch in diameter. Each .09
- 20% discount from dozen price in lots of 144. Per dozen .90
1860. BRUSHES, Cream Bottle, for bottles with necks not less than $\frac{3}{8}$ inch in diameter. Each .15
- 20% discount from dozen price in lots of 144. Per dozen 1.50
1866. BRUSHES, Pencil, of camel's hair bound in quill. Size small medium large
- Per dozen20 .40 .50
- 20% discount in lots of 144.
1868. BRUSHES, Pencil, of camel's hair, quill handles, silk bound.
- Length of hair, mm..... 14 18 22
- Per dozen 1.45 1.65 2.50
- 20% discount in lots of 144.
1870. BRUSH, Pipette, for use in cleaning volumetric, Mohr's or milk pipettes..... .15
- 10% discount in lots of 12. 25% discount in lots of 144.
1872. BRUSHES, Scale Pan, of camel's hair, wooden handle, metal bound. Length of hair, about 1 inch.
- Width of hair part, inches..... $\frac{1}{2}$ 1 $1\frac{1}{2}$ 2
- Each20 .30 .40 .50
- 10% discount in lots of 12.
1876. BRUSH, Soil Percolation Tube, for cleaning tubes used in soil testing. Of unbleached bristles, with tufted end, and wooden handle. Length of bristle part, 7 inches; diameter, 2 inches; length over all, 3 feet 9 inches..... .80
1878. BRUSH, Soil Sampling Tube, for cleaning tubes used in sampling soils. Of stiff vegetable fiber with strong twisted wire handle. Length of bristle part, $4\frac{1}{2}$ inches; diameter, $1\frac{1}{8}$ inches; total length, 65 inches..... .20

BRUSHES

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



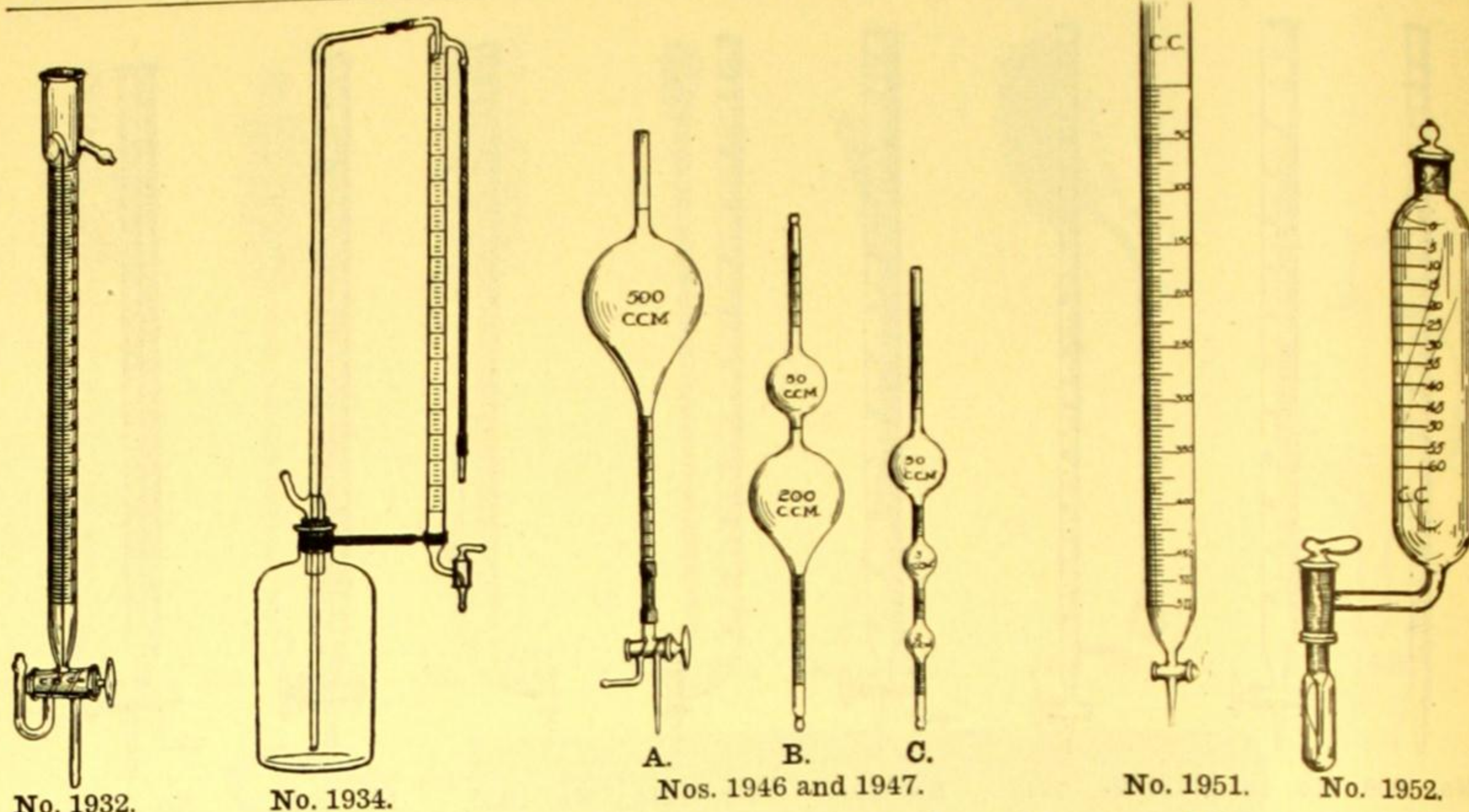
1880. BRUSH, Test Tube, bristle end, brass wire. Length of bristle part over all, $4\frac{1}{4}$ inches; diameter, $1\frac{3}{8}$ inches; total length, $10\frac{3}{4}$ inches. Each \$0.09
 20% discount from the dozen price in lots of 144. Per dozen .85
1882. BRUSH, Test Tube, same as No. 1880, but with tinned wire. Each .07
 20% discount from the dozen price in lots of 144. Per dozen .70
1884. BRUSH, Test Tube, sponge end, brass wire, for test tubes $\frac{5}{8}$ inch or larger in diameter. Length of bristle part including sponge, $3\frac{1}{2}$ inches; diameter, $1\frac{3}{8}$ inches; total length, 11 inches. Each .10
 20% discount from the dozen price in lots of 144. Per dozen 1.00
1886. BRUSH, Test Tube, same as No. 1884, but with tinned wire. Each .07
 20% discount from the dozen price in lots of 144. Per dozen .70
1888. BRUSH, Test Tube, tinned wire. Length of bristle part, $3\frac{1}{2}$ inches; diameter, 1 inch; total length, 10 inches. Each .06
 20% discount from the dozen price in lots of 144. Per dozen .60
1890. BRUSHES, Test Tube, Dolbey's (Patented), with tuft of bristles so constructed as to reach all parts of tube, yet affording the most perfect protection to the tube from breakage by the wire end. This is the best test tube brush made and we heartily recommend it to laboratory workers who have been looking for something better than the old style brush with the constant annoyance from breakage or imperfect cleansing. Length, $13\frac{1}{2}$ inches; for test tubes $\frac{5}{8}$ to $\frac{3}{4}$ inch diameter. Each .09
 20% discount from the dozen price in lots of 144. Per dozen .90
1892. BRUSHES, Test Tube, Probangs, with rattan handle and sponge end. Length over all, 9 inches. Each .15
 20% discount from the dozen price in lots of 144. Per dozen 1.45
1894. BRUSHES, Tube, for small tubes and funnel stems, of bristles on tinned wire. Length of bristle part, 2 inches; diameter, $\frac{1}{2}$ inch; total length, $12\frac{1}{2}$ inches. Per dozen .35
 20% discount in lots of 144.
1896. BRUSHES, Volumetric Flask, with flexible steel spring enabling the brush to reach every part of flask. No. A B C
 For flasks, capacity, cc. 250 500 1000
 Each38 .40 .45
 10% discount in lots of 12.
- BULBS, Absorption, see Absorption Bulbs; Potash Bulbs.
1902. Bulbs, Leveling, of glass, for use in gas analysis. 250 500
 Capacity, cc80 1.00
 Each80 1.00
- BULBS, Nitrogen or Kjeldahl, see Nitrogen Apparatus.
 BULBS, Rubber, see Rubber Bulbs.



BURETTES

1908.	BURETTES, for pinch cock, without fittings.			
	Capacity, cc	25	50	100
	Graduated in, cc.....	1/10	1/10	1/5
	Each	\$0.55	.70	.90
	ATTACHMENT for No. 1908, see Burette Accessories.			
1912.	BURETTES, with straight glass stop-cock.			
	Capacity, cc	10	25	50
	Graduated in, cc.....	1/20	1/10	1/10
	Each	1.25	1.35	1.45
1914.	BURETTES, with straight glass stop-cock and side tube for refilling.			
	Capacity, cc		25	50
	Graduated in, cc.....		1/10	1/10
	Each		1.80	1.90
1916.	BURETTES, with three-way stop-cock.			
	Capacity, cc		25	50
	Graduated in, cc.....		1/10	1/10
	Each		2.25	2.65
1918.	BURETTES, with Fresenius stop-cock.			
	Capacity, cc		50	100
	Graduated in, cc.....		1/10	1/5
	Each		1.80	2.50
1920.	BURETTES, with Fresenius stop-cock and side tube with glass stop-cock in same, for refilling, according to Gawalowski.			
	Capacity, cc		50	100
	Graduated in, cc.....		1/10	1/5
	Each		3.50	4.00
1924.	BURETTES, Schellbach, for pinch cock, with blue line on white background to facilitate reading of miniscus; without fittings.			
	Capacity, cc	25	50	100
	Graduated in, cc.....	1/10	1/10	1/5
	Each	1.30	1.50	3.00
1928.	BURETTES, Schellbach, with straight glass stop-cock.			
	Capacity, cc	25	50	100
	Graduated in, cc.....	1/10	1/10	1/5
	Each	2.40	3.00	4.00
1930.	BURETTES, Schellbach, with three-way stop-cock.			
	Capacity, cc		50	100
	Graduated in, cc.....		1/10	1/5
	Each		4.00	5.00

Note.—10% discount in lots of 12, 20% discount in lots of 72 from all prices on this page.



No. 1932.

No. 1934.

Nos. 1946 and 1947.

No. 1951.

No. 1952.

1932. **BURETTES**, Schellbach, Automatic, with zero point and overflow cup. With three-way stop-cock, for refilling from reservoir.

Capacity, cc	25	50	100
Graduated in, cc.....	1/10	1/10	1/5
Each	\$4.00	5.00	6.00

10% discount in lots of 12.

1934. **BURETTES**, Automatic, Squibb's, consisting of a Schellbach burette with Fresenius stop-cock mounted on reservoir. Complete with reservoir, clamp and suction tube, but without pressure bulb. Capacity of burette, 50 cc. Graduated in 1/10 cc divisions..... 8.50

1935. **BURETTE** only of No. 1934..... 5.00

1936. **CLAMP** only of No. 1934..... .75

PRESSURE BULB for No. 1934, see No. 11530.

1946. **BURETTES**, Calibrating, Morse's, for flasks, burettes, and pipettes. Without stop-cock.

No.	A	B	C
Capacity of bulbs, cc.....	500	200 & 50	50, 3 & 2
Each	8.00	8.00	8.00

1947. **STOP-COCK**, three-way, for No. 1946..... 3.00

1948. **BURETTE**, Calibrating, Morse's, graduated from 1.5 to 2.5 cc, with three-way stop-cock, for small quantities 6.00

1951. **BURETTES**, Dispensing, with straight glass stop-cock.

Capacity, cc.....	250	500	1000
Graduated in, cc.....	2	5	10
Each	2.80	3.90	5.00

10% discount in lots of 12.

1952. **BURETTE**, Weighing, Ripper's, arranged for suspending from balance hook by aluminum wire. Graduated to 60 cc in 5 cc divisions..... 3.50

BURETTES, PRECISION

The precision burettes listed here are the product of manufacturing establishments with whose methods of calibration and standardization we are thoroughly familiar. We believe those without certificate to be as reliable as any obtainable. We strongly recommend, however, that every analytical laboratory purchase at least one burette which has been tested by the Bureau of Standards by which to check their uncertified standards.

1958. **BURETTES**, Precision or Normal, for pinchcock, graduated to meet the requirements of the United States Bureau of Standards. Without fittings.

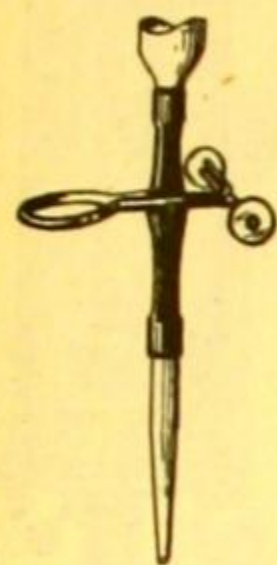
Capacity, cc.....	50	100
Graduated in, cc.....	1/10	1/5
Each	5.50	6.50

1960. **BURETTES**, Precision or Normal, with straight glass stop-cock with curved tip. Graduated to meet the requirements of the United States Bureau of Standards.

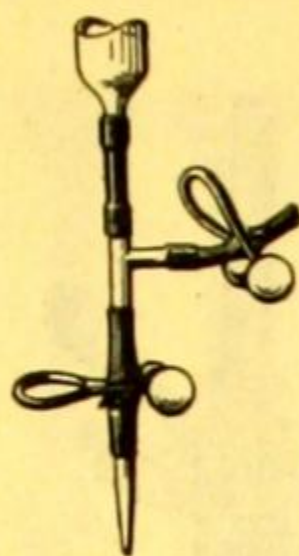
Capacity, cc.....	25	50	100
Graduated in, cc.....	1/10	1/10	1/5
Each	4.00	5.00	6.00

1962. **BURETTES**, Standard, with straight glass stop-cock with curved tip, tested by the United States Bureau of Standards. With control stamp and certificate of corrections.

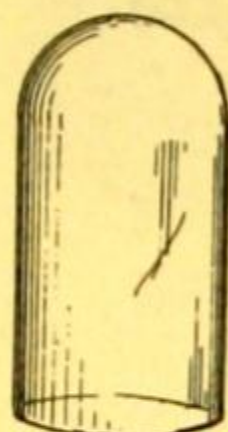
Capacity, cc	25	50	100
Graduated in, cc.....	1/10	1/10	1/5
Each	9.00	10.00	11.00



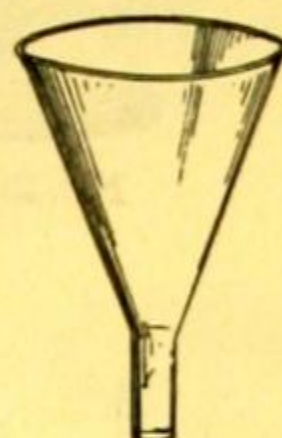
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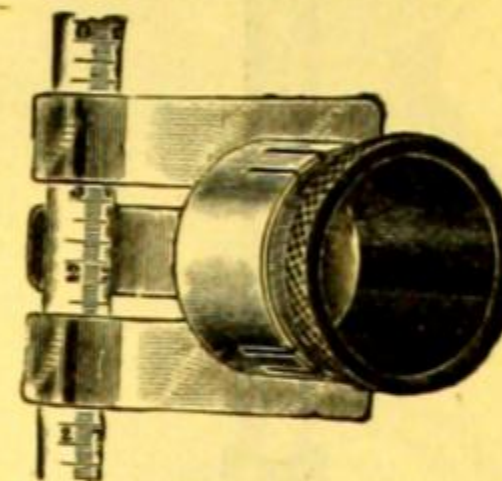
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No. 1976.



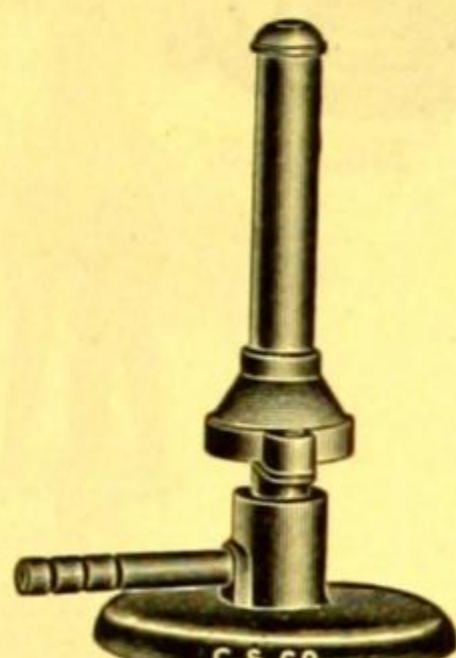
No. 1982.



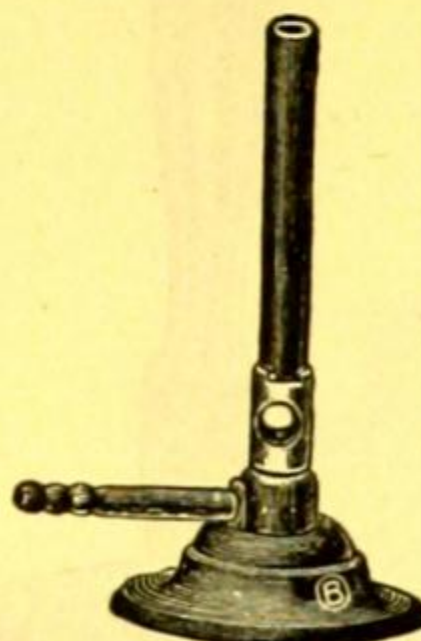
No. 1984.



No. 1980.



No. 1990.



No. 1992.



No. 1998.



No. 2000.

BURETTE ACCESSORIES

1968.	BURETTE ATTACHMENT, consisting of glass tip with rubber connection and pinch-cock.	\$0.25
1970.	BURETTE ATTACHMENT, three-way, for refilling from reservoir. Complete with glass tip, T-tube, rubber connection, and two pinch-cocks	.50
1971.	GLASS TIPS only for Nos. 1968-70.	per dozen .50
1976.	BURETTE CAPS, to protect inside of burettes from dust.	
	No.	B C
	For burettes, cc.	50 100
	Each	.08 .10
	Per dozen	.75 1.00
1980.	BURETTE FLOAT, Erdman's, with points to prevent adherence to the side of the burette	.70
1982.	BURETTE FUNNEL, 1 inch in diameter, for use in filling burettes.	.22
1984.	BURETTE MENISCUS READER, consisting of a nickel-plated brass clamp to fasten on the burette, with adjustable eyepiece.	3.00

BURNERS FOR GASEOUS FUELS

Acetylene.

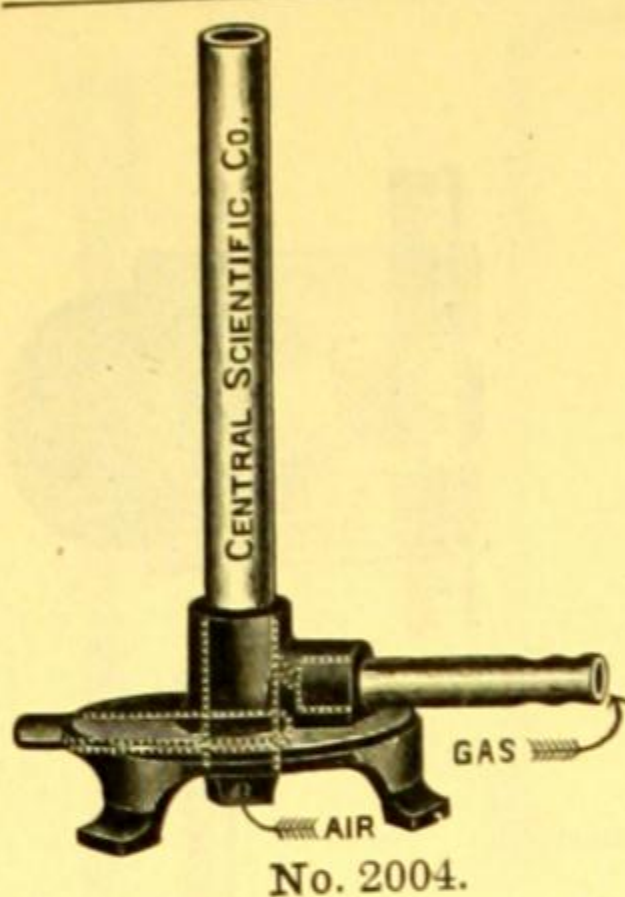
1990.	BURNER, Bunsen, for acetylene gas. Height of burner, 5½ inches; diameter of tube, 9/16 inch	2.50
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Coal Gas.

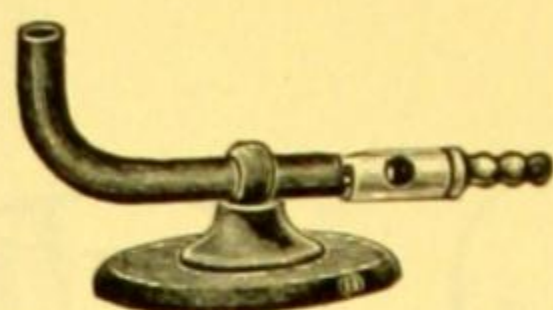
1992.	BURNER, Bunsen, with air regulator and slot-shaped nipple which can easily be adjusted to suit the local conditions of gas pressure. Height, 5½ inches; diameter of tube, 7/16 inch. Polished aluminum tube and regulator, with japanned iron base.	.35
	10% discount in lots of 12, 25% discount in lots of 144.	
1994.	BURNER, Bunsen, similar to No. 1992 but larger in size. Height, 5½ inches; diameter of tube, ½ inch	.60
	10% discount in lots of 12.	
1998.	BURNER, Bunsen, same as No. 1992, without base, and with stop-cock, for screwing into gas pipe. Convenient for constructing digestion shelves, etc. Total length, 6 inches; diameter, 7/16 inch.	.80
	10% discount in lots of 12, 25% discount in lots of 144.	
2000.	BURNER, Bunsen, with stop-cock and pilot flame. Height, 6 inches; diameter of tube, ½ inch	1.60
	10% discount in lots of 12.	

BURNERS

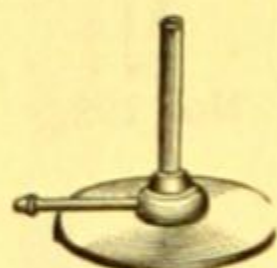
CENTRAL SCIENTIFIC CO., CHICAGO. U. S. A.



No. 2004.



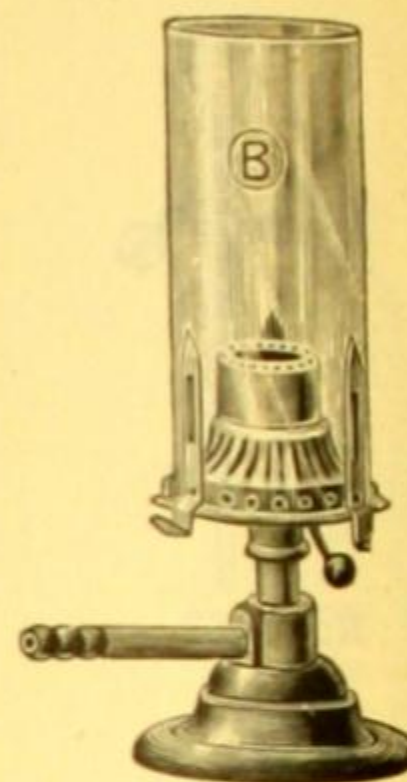
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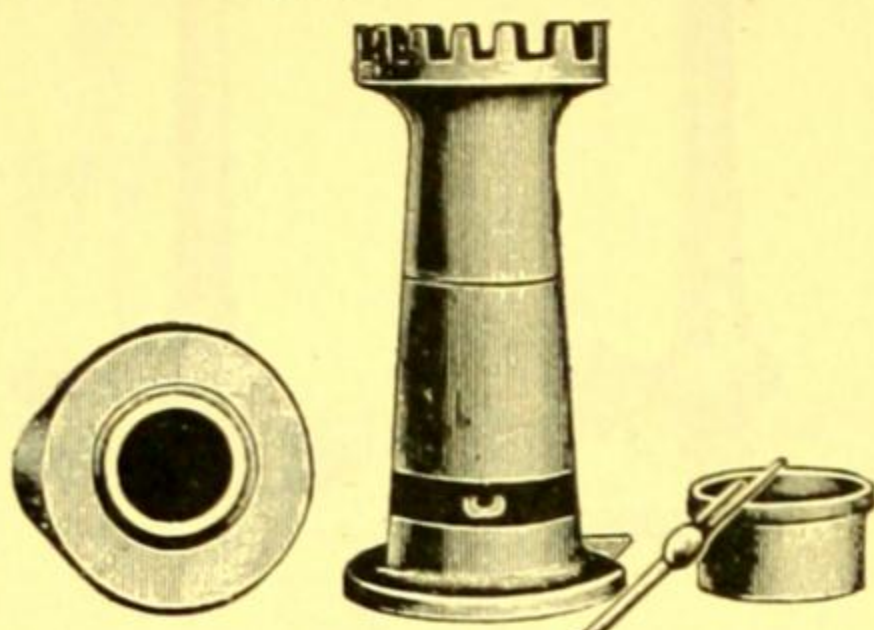
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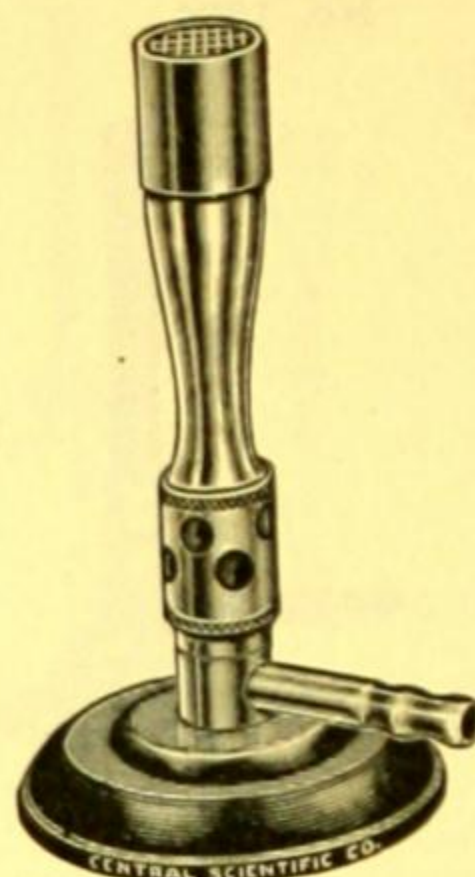
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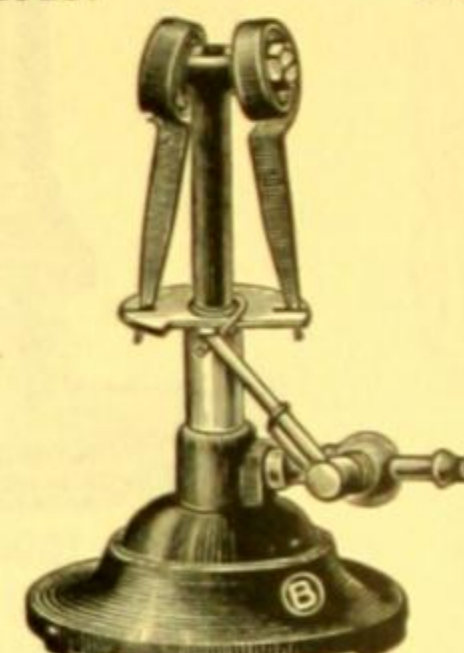
No. 2020.



No. 2028.

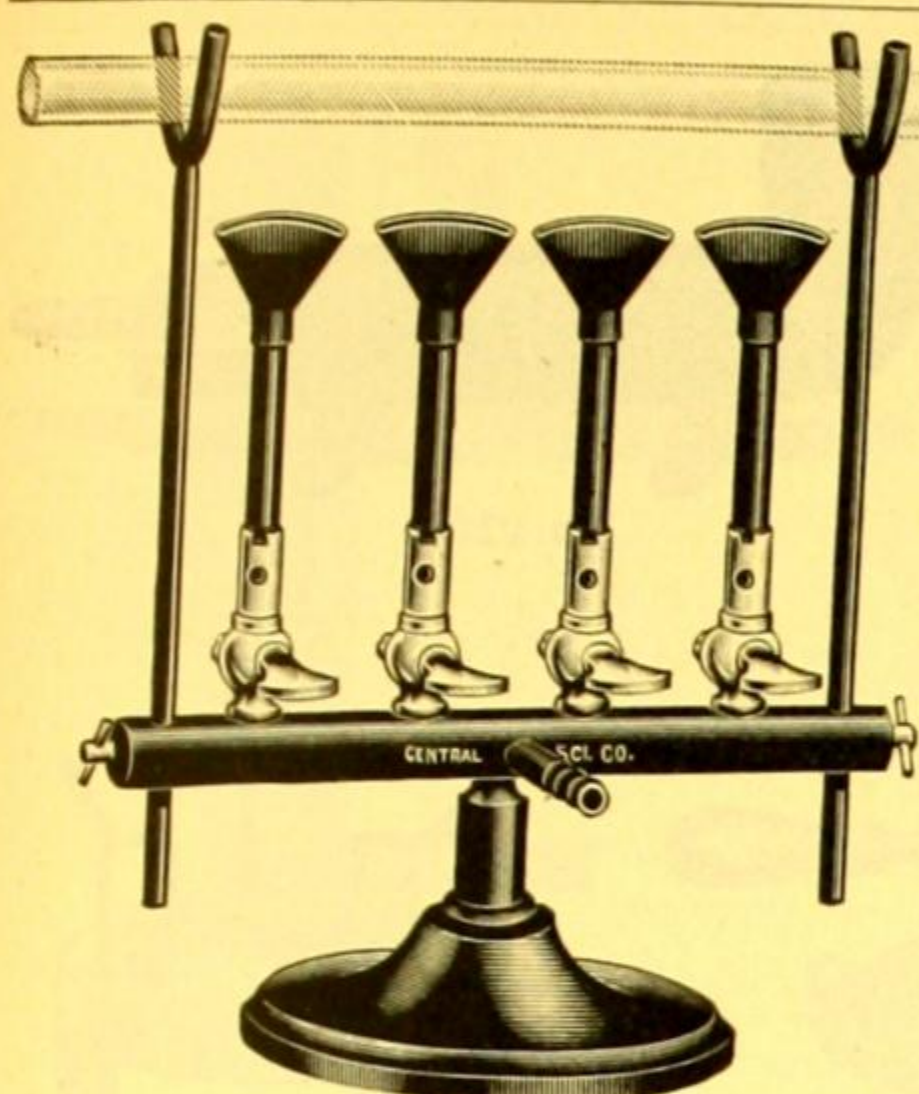


No. 2044.

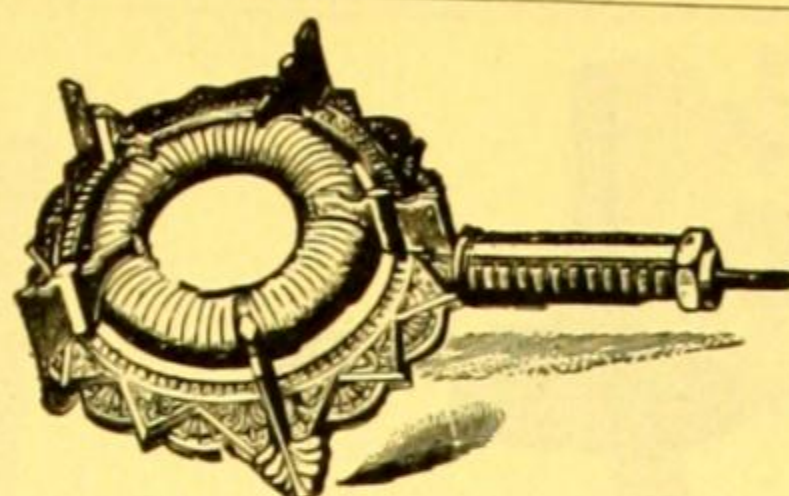


No. 2034.

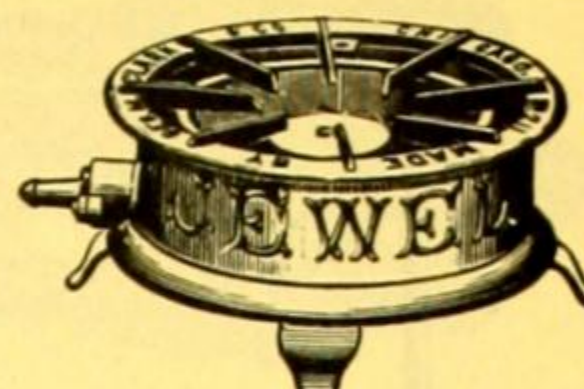
2004. **BURNERS, Bunsen, Central Draft**, an excellent burner for elementary student use. Substances accidentally dropped in tube will fall through without clogging gas inlet. Height, 5 $\frac{3}{4}$ inches; diameter of tube, $\frac{7}{16}$ inch. With air regulator each \$0.45
10% discount in lots of 12. 25% discount in lots of 144.
2008. **BURNER, Bunsen, low form**, with air regulator. Length, 5 $\frac{1}{2}$ inches; height, 3 inches; diameter of tube, $\frac{7}{16}$ inch..... .60
10% discount in lots of 12.
2010. **BURNER, Bunsen, micro form**, nickel-plated, 2 inches high, tube $\frac{1}{4}$ inch in diameter..... .70
10% discount in lots of 12. 25% discount in lots of 144.
2013. **BURNER, Bunsen, Self-Lighting**. Especially convenient for the lecture table and for analytical laboratories. A pressure of the finger on the right hand button turns on the gas and lights it; the other button turns off the gas, thus avoiding the necessity of turning it off at the stop-cock 2.00
- 2013A. **SPARK RENEWALS** for No. 2013..... each .10
per dozen 1.00
2020. **BURNER, Argand**, adjustable flame, with 8 inch mica chimney. Especially desirable where uniform temperature is essential. Total height, including chimney, 11 inches..... 1.60
10% discount in lots of 12.
2820. **CHIMNEY** for Argand Burners, of glass. Height, 7 inches; diameter, 2 inches..... each .20
per dozen 1.90
2025. **CHIMNEY** for Argand Burners, of mica. Height, 8 inches; diameter, 2 inches..... .30
2028. **BURNER, Chaddock's**, made of porcelain and white fire clay, incorrodible and extremely durable. Intended especially for use in hoods, where metal burners corrode. No support or wire gauze necessary. Complete with air regulator, support for dishes, chimney for triangles, asbestos disk and rings. Height including dish support, 9 inches; outside diameter of dish support, 4 inches..... 4.00
2029. **DISH SUPPORT, or Castle Top**, for No. 2028..... .55
- 2034A. **BURNERS, Koch Safety**, with automatic valve to shut off gas when flame is extinguished. Valve is operated by spring controlled by expansion and contraction of metallic spirals. Especially desirable in heating incubators or other apparatus where flame must be kept in operation over long periods of time. With threaded inlet for attaching metallic tubing. Height, 5 inches; diameter of tube, $\frac{5}{16}$ inch..... 7.50
- BURNERS, Meker**, a very powerful burner designed on scientific principles which eliminates entirely the cold Bunsen cone and gives a flame that is practically a homogeneous mass of burning gas with a temperature that is nearly uniform throughout. Nos. 1 and 2 are to be used instead of the Bunsen Burner; No. 3, the general laboratory type; Nos. 4 and 5, to replace the blast lamp. No. 1 2 3 4 5
Height of burner, mm..... 115 130 155 190 250
Diameter of flame, mm..... 16 20 25 30 43
2044. **For artificial gas**..... 2.00 2.20 2.60 3.20 6.50
2045. **For natural or gasoline gas**..... 2.00 2.20 2.60 3.20 6.50



No. 2066.



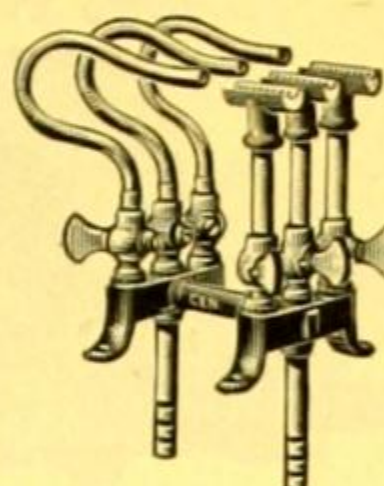
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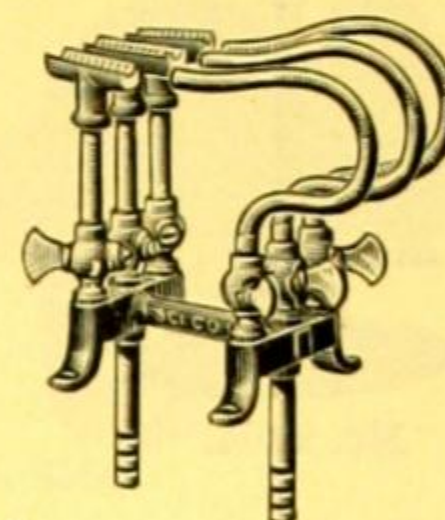
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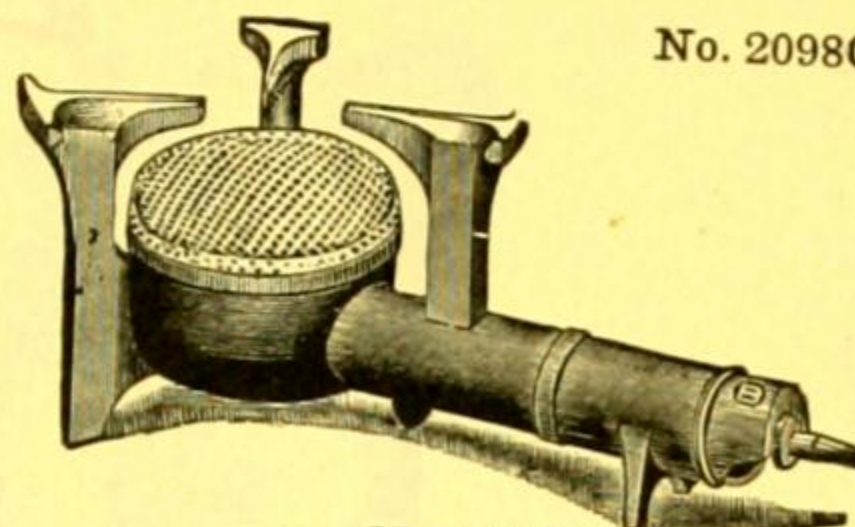
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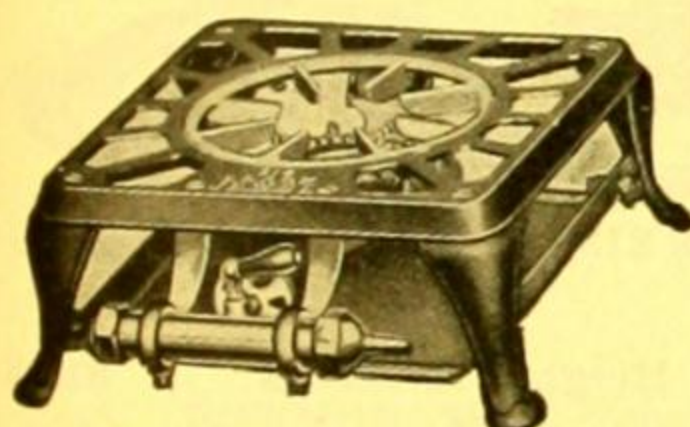
No. 2098C.



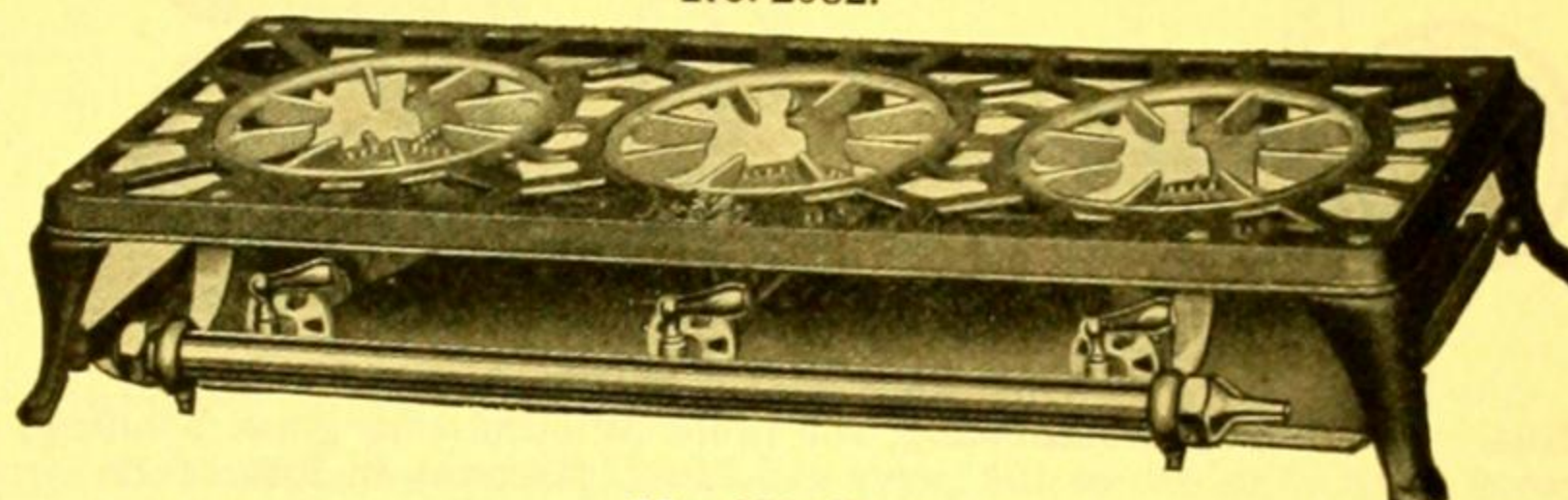
No. 2070A.



No. 2082.



No. 2094A.

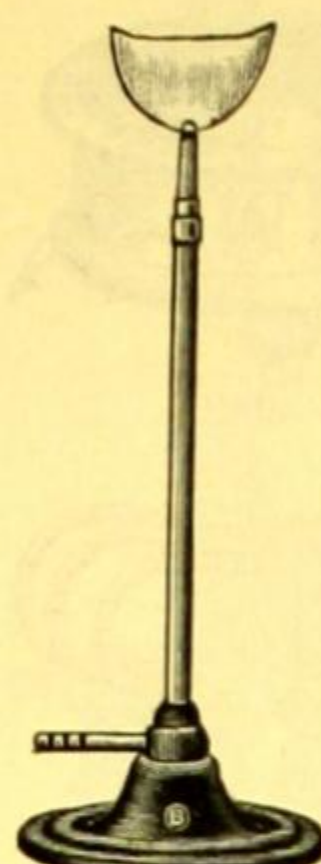


No. 2094C.

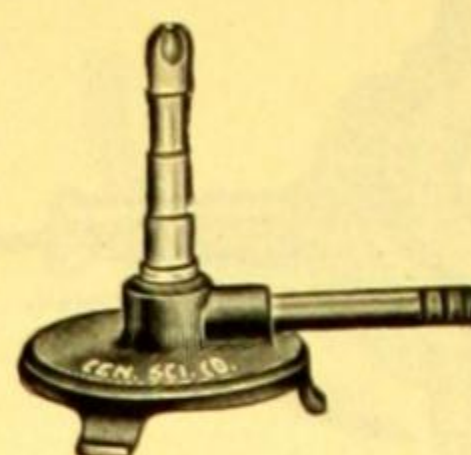
2066. **BURNERS, Bunsen (Simple Combustion Furnace).** Consists of four No. 1998 burners with stop-cocks, air regulators and wing tops, mounted on a gas supply tube with adjustable forks for holding combustion tubes. Without glass tube \$13.00
- 2070A. **BURNER, Fletcher's Evaporating,** made of solid copper with lap joints. An excellent burner for heating flasks or beakers, as it is free from cold spots or cold air currents, nor does the direct flame come in contact with the glass. Diameter, 4 inches; height, about 1½ in.. 3.50
2078. **BURNERS, Fletcher's Radial,** of cast iron, easily cleaned.
- | No. | A | B |
|---------------------------------------|------|------|
| Diameter of ring, inches..... | 3¾ | 5 |
| Diameter of stand, inches..... | 6½ | 8 |
| Gas consumption per hour, cu. ft..... | 12 | 18 |
| Each | 2.50 | 3.25 |
2082. **BURNER, Fletcher's Solid Flame,** for quick heating of large surfaces. Diameter of flame surface, 4¼ inches; gas consumption per hour, 35 feet..... 2.50
2085. **PERFORATED CAPS, Copper,** for No. 2082..... each .60
2088. **BURNER, Gas Stove,** round portable, with cast iron top and base, and Russia iron body. Steel drip pan is beneath burner and top is raised. Total height, 4¼ inches; diameter, 9 inches. 1.80
2094. **BURNERS, Gas Stove,** with radial burners. Finished in black japan and nickel-plate. For coal gas unless otherwise specified.
- | No. | A | B | C |
|--------------------------------|-------|-------|-------|
| Number of burners..... | 1 | 2 | 3 |
| Size of top plate, inches..... | 12x12 | 12x22 | 12x32 |
| Each | 5.00 | 7.30 | 11.50 |
- 2098C. **BURNERS, Glass Blowers' Fires,** on base with four legs for attachment to table top, with gas and air inlet tubes vertical. Set consists of two parts with three burners each as illustrated. 14.00
2099. **BURNER TIP** for glass blowers' fires, concave80

BURNERS

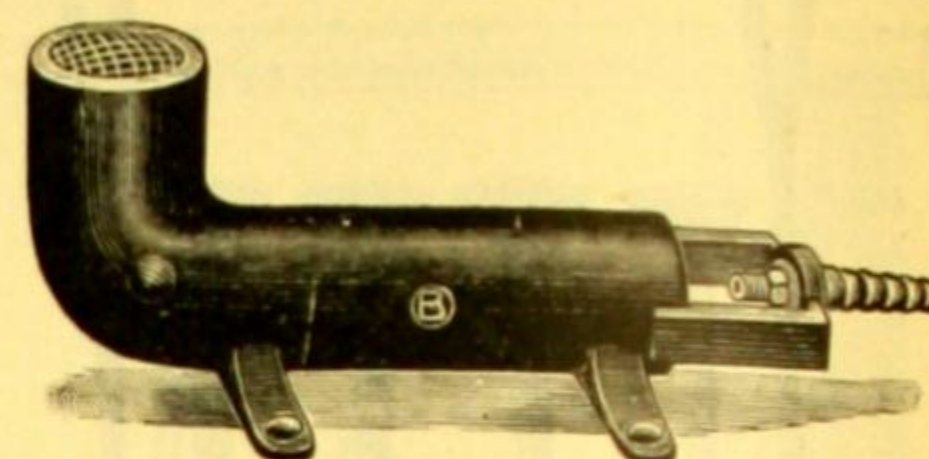
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



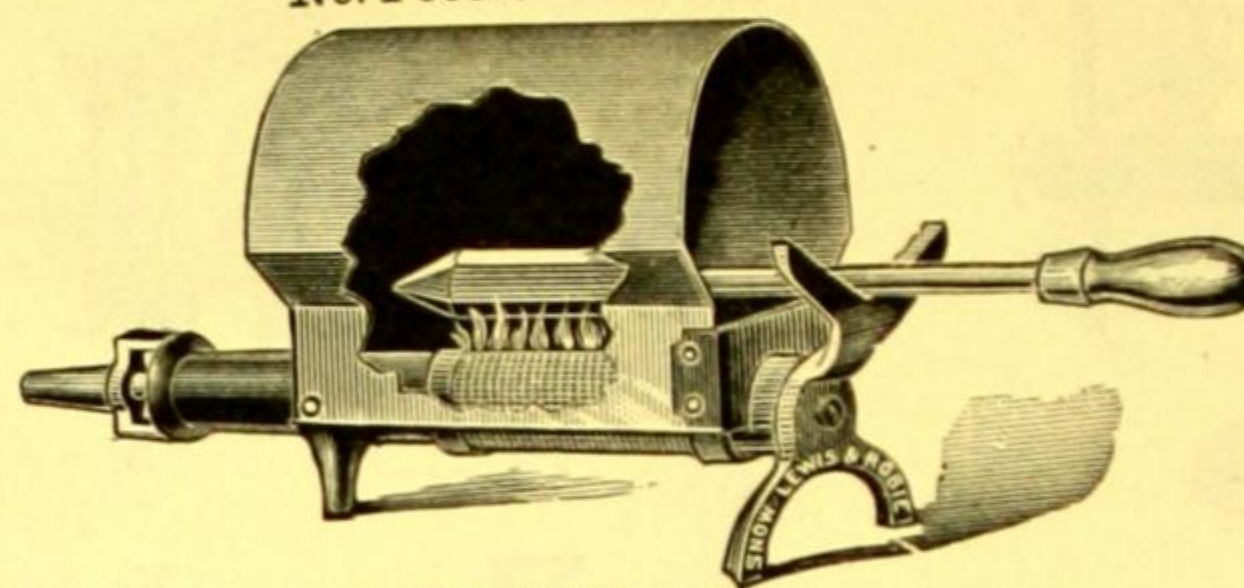
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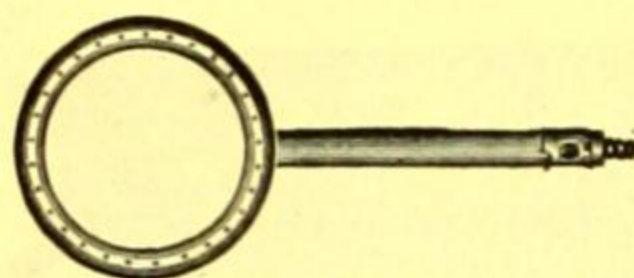
No. F6681.



No. 2108.



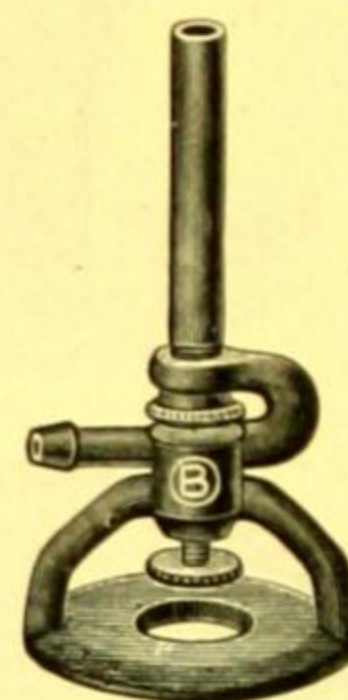
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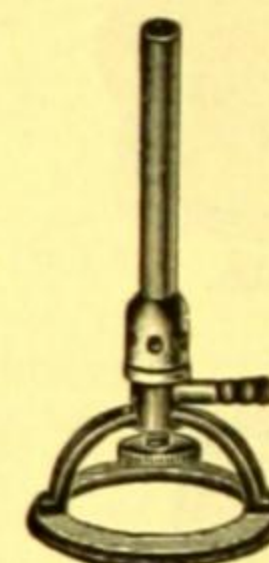
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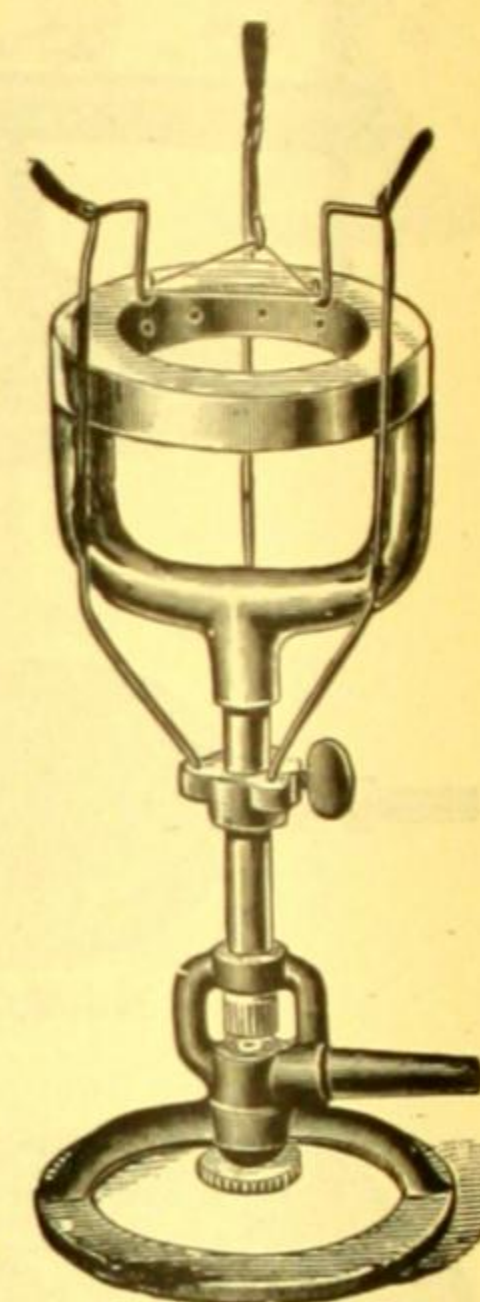
No. 2122.



No. 2126.



No. 2132.

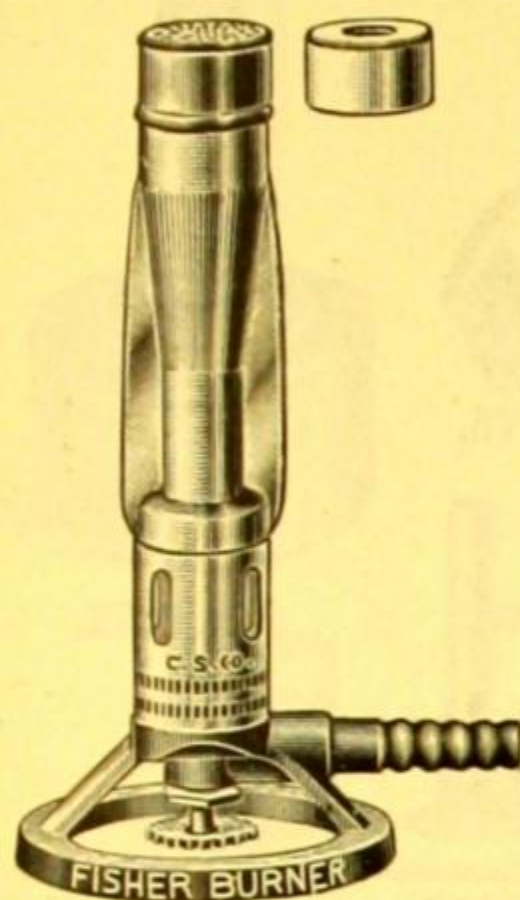


No. 2112.

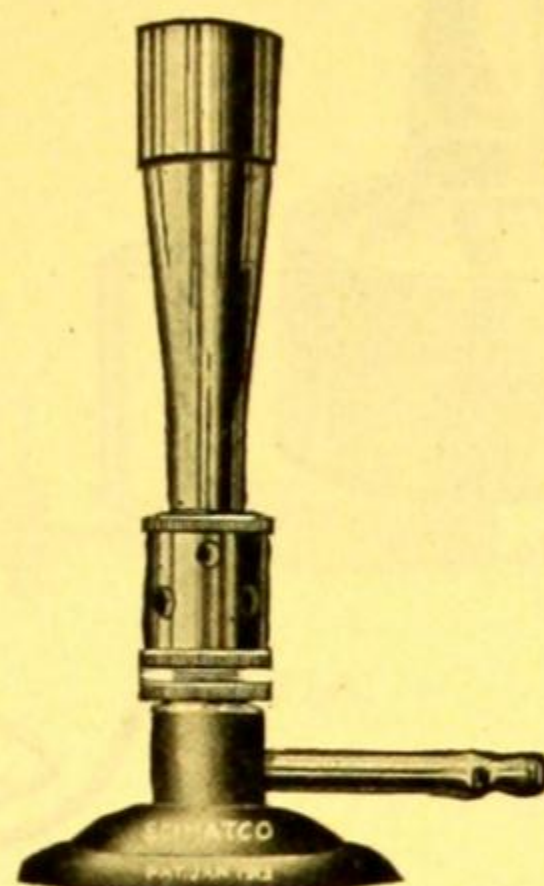
2104. **BURNER**, Illuminating, for table illumination, glass bending, etc. Height, 12 inches.... \$1.35
10% discount in lots of 12.
- F6681. **BURNER**, Illuminating, low form, with aluminum gas tip..... .60
2108. **BURNER**, Low Form, extra large, with gauze top. Height, 5 inches; diameter, 2 1/4 inches; extreme length, 14 inches. A valuable burner for use in heating sterilizers and incubators 3.00
2110. **BURNERS**, Ring Form, with air regulator, to be attached to support by means of a right angle clamp, such as No. 2914.
- | No. | A | B | D |
|-----------------------|------|------|------|
| Diameter, inches..... | 3 | 4 | 6 |
| Each | 1.90 | 2.00 | 2.50 |
2112. **BURNER**, Roger's Ring, for heating platinum crucibles without bumping while evaporating strong solutions. Flame is applied to upper part of crucible only. Complete with platinum triangle of No. 26 wire..... 10.00
2114. **BURNER**, Soldering Iron Heater, simple construction, cast iron base, with Russia iron hood. Total height, 6 1/2 inches; extreme length, 14 inches 2.00

Burners, Adjustable, for Use With Coal, Gasoline or Natural Gas.

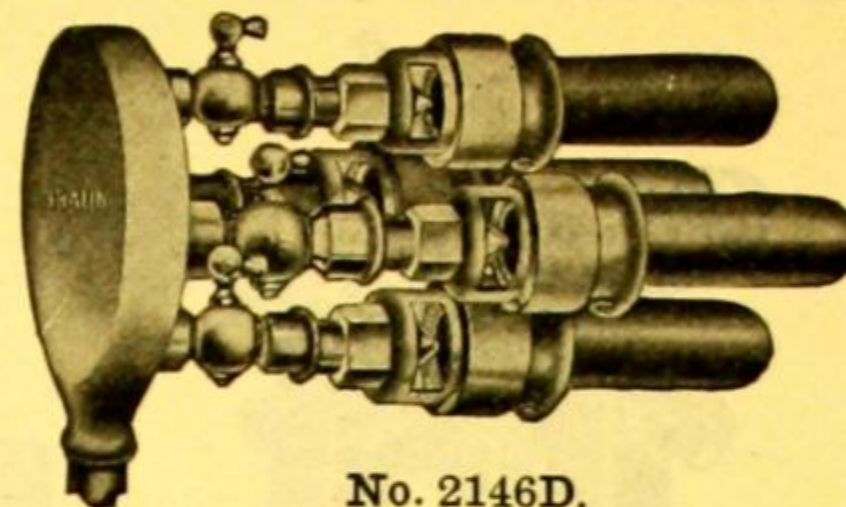
2122. **BURNER**, Bunsen, adjustable, without base, for screwing directly into gas pipes. Useful in making up rows of burners for Kjeldahl digesting shelves, etc. Length, 6 1/4 inches; diameter of tube, 1/2 inch..... 1.10
2126. **BURNER**, Boyce's Adjustable, with improved regulator for air and gas. The best low priced burner for coal, gasoline, or natural gas, as the tube is stationary, permitting all burner attachments to be used with it to the best advantage. Very satisfactory for use with Blau gas .75
2132. **BURNER**, Tirrill Type, substantially constructed, with regulators for air and gas. Considered one of the best burners made for use with coal, natural or gasoline gas. Height, 6 inches; diameter of tube, 7/16 inch. Very satisfactory for use with Blau gas..... 1.40
10% discount in lots of 12, 25% discount in lots of 144.



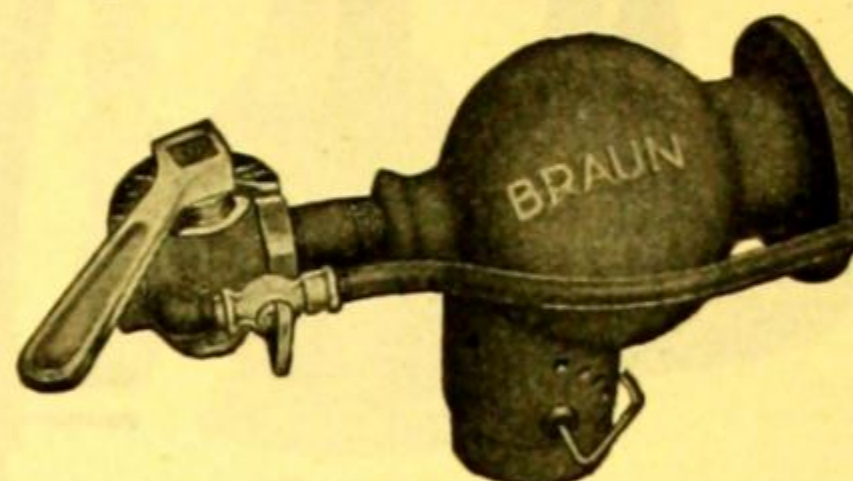
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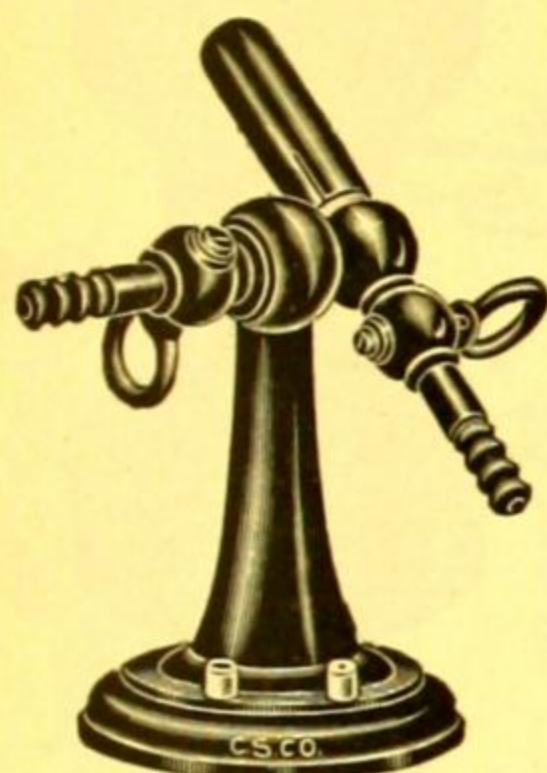
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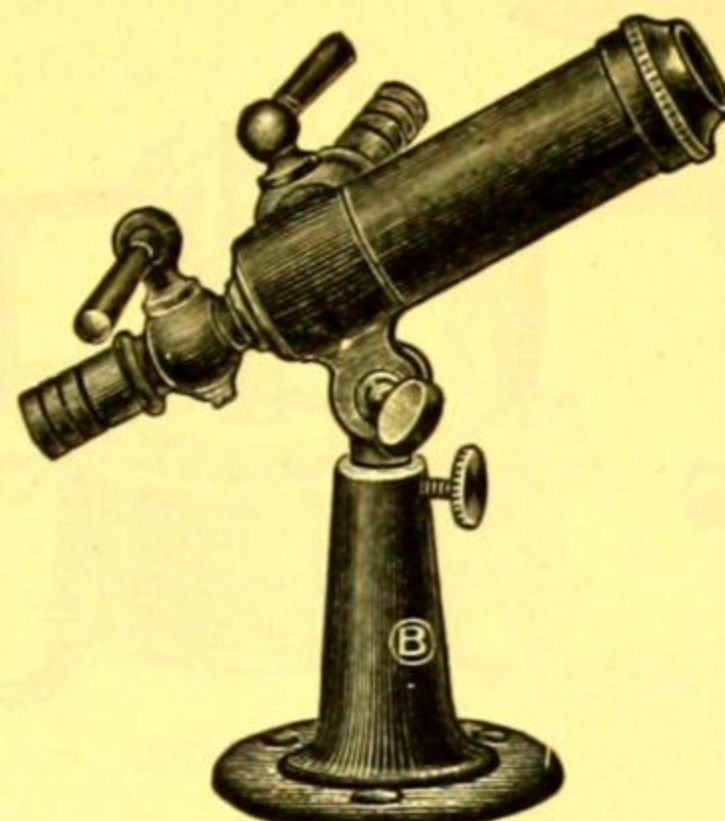
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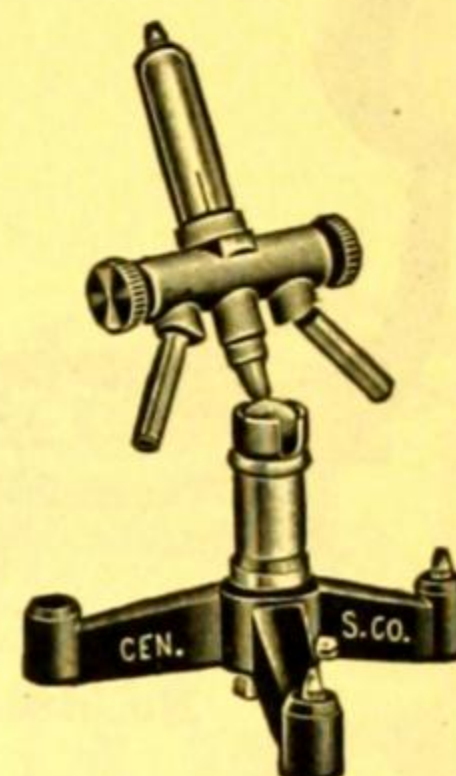
No. 2150.



No. 2152.



No. 2154.



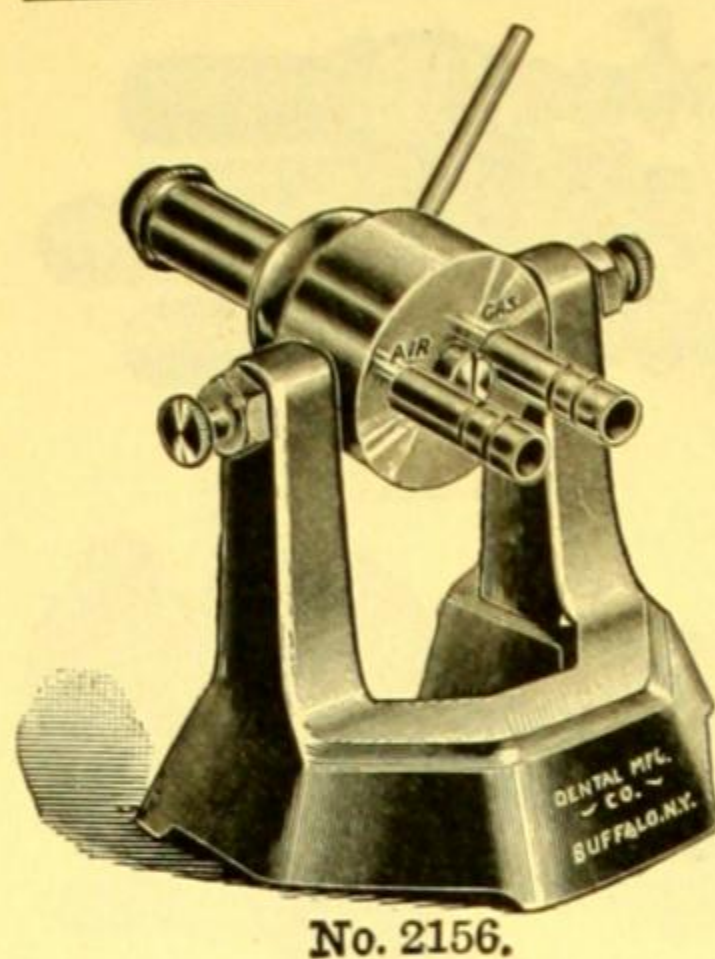
No. 2155.

Burners, High Temperature.

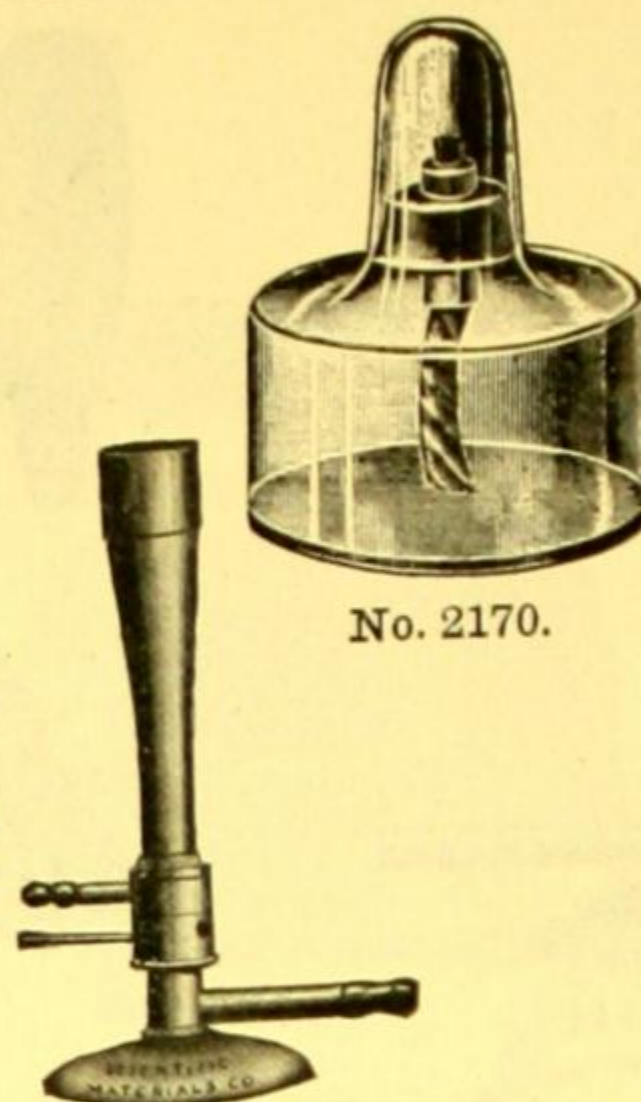
2142. **BURNER, High Temperature, Fisher's**, a burner of the Meker type, but so designed as to secure the greatest economy in production by the use of automatic machine processes. A perforated nickel cap is furnished for producing a Meker type of flame and a brass cap with hole for the usual Bunsen flame. Height, 7 inches; diameter of flame, $1\frac{1}{8}$ inches. \$1.75
2144. **BURNERS, High Temperature**, of Meker type with adjustment for air and gas. Constructed of brass with grid top.
- | | | |
|-------------------------------|----------------|----------------|
| No. | 3 | 4 |
| Height of burner, inches..... | $6\frac{3}{4}$ | $7\frac{1}{2}$ |
| Diameter of flame, mm..... | 25 | 30 |
| Each | 3.00 | 3.50 |
- 2146D. **BURNERS, Braun's Vulcan Non-Blast**, for coal or natural gas, for use with Braun Furnaces. These are non-blast burners operating without noise and upon regular gas pressure. Each tube consumes about 50 cubic feet of gas per hour. Complete with four burners with separate regulating valve for each burner. 16.00

Burners, Blast.

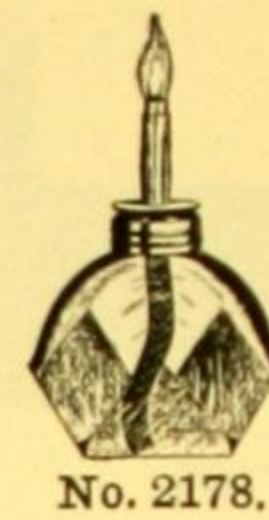
2150. **BURNER, Blast, Braun Gas**, for use with artificial or natural gas. Designed for use with Furnace No. 6398. Requires a blower to furnish sufficient amount of air. (See Nos. 1406-8.) Should be connected to a $\frac{3}{4}$ -inch gas supply line. Shipping weight, 18 pounds. Complete with air and gas valves. 16.00
2152. **BURNER, Blast, Bunsen's**, with three interchangeable gas tips and with stop-cocks on gas and air inlet tube. An excellent lamp for ordinary laboratory use. Height with tube horizontal, about $4\frac{1}{2}$ inches. Should be used with Foot Blowers Nos. 1374-6. For coal gas only. 4.00
2154. **BURNER, Blast, Bunsen's**, extra large size, on adjustable stand, with two tips. Length, $8\frac{1}{2}$ inches; height with tube horizontal, $6\frac{1}{2}$ inches, adjustable to 8 inches; diameter of body, $1\frac{3}{8}$ inches; gas and air nipples to take $\frac{5}{8}$ inch rubber tubing. Requires blower capable of furnishing a flow of air under a pressure of 4 to 16 pounds, depending upon which tip is used. For coal gas only. 10.00
2155. **BURNER, Blast**, similar in construction to Bunsen's but with needle valves instead of stop-cocks. Mounted on ball and socket joint, with set of three gas tips and two sleeves. Can be used with coal, gasoline or natural gas. 6.25



No. 2156.



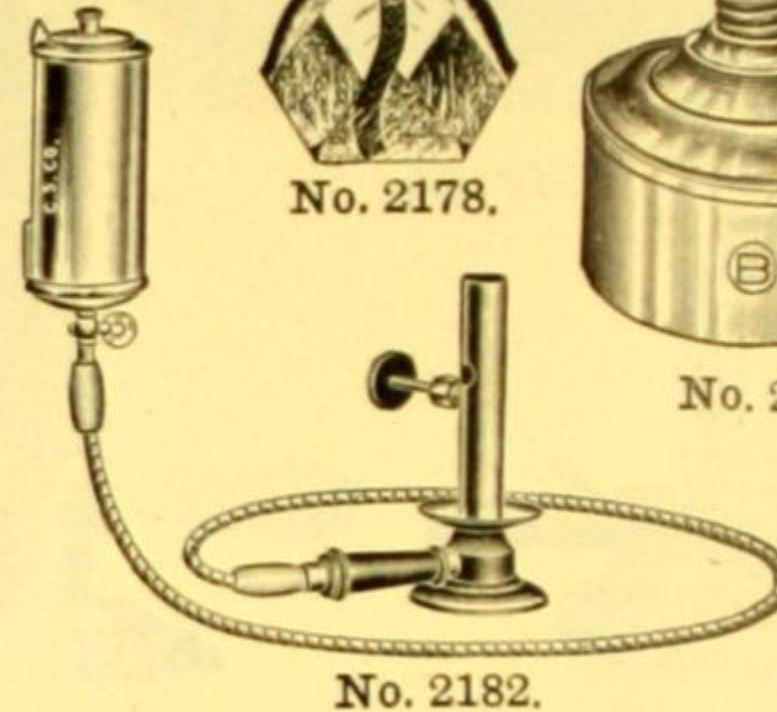
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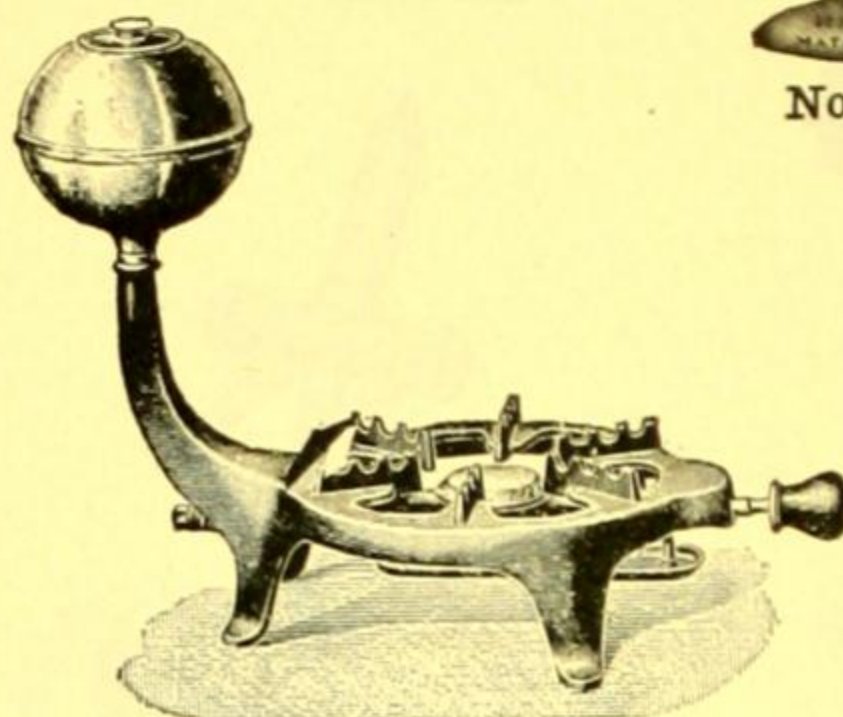
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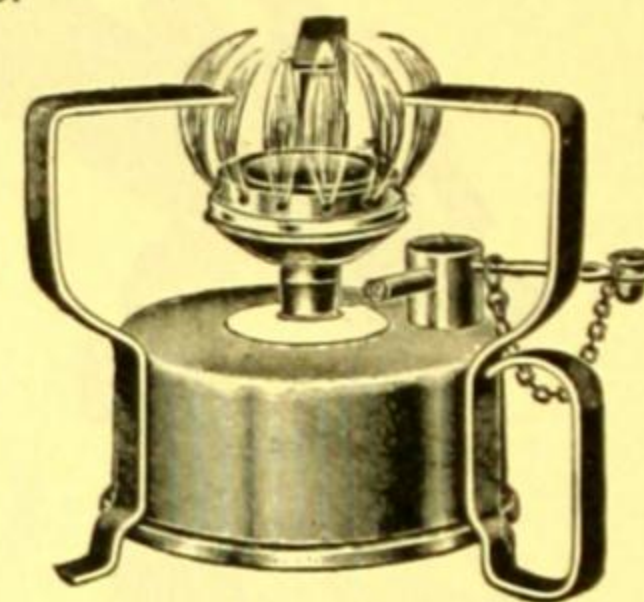
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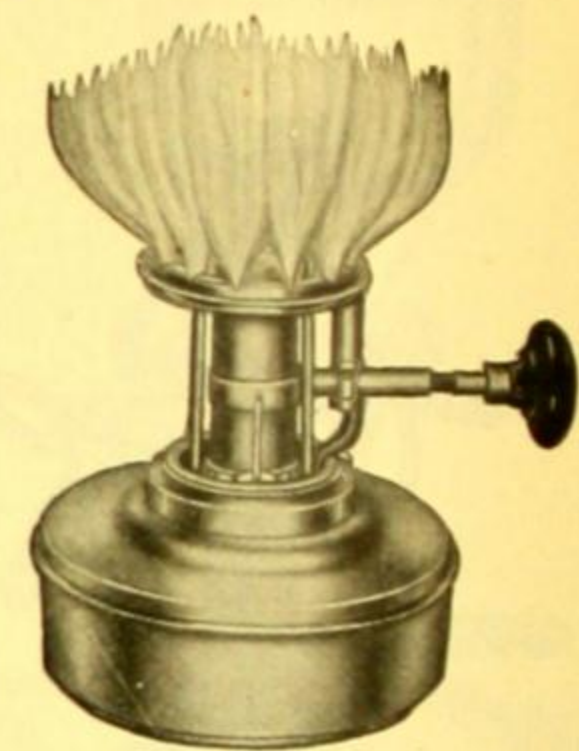
No. 2182.



No. 2186A.



No. 2192.



No. 2194.

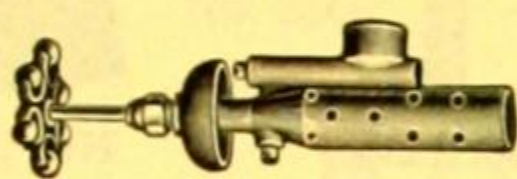
BURNERS FOR LIQUID FUELS

Burners, Alcohol

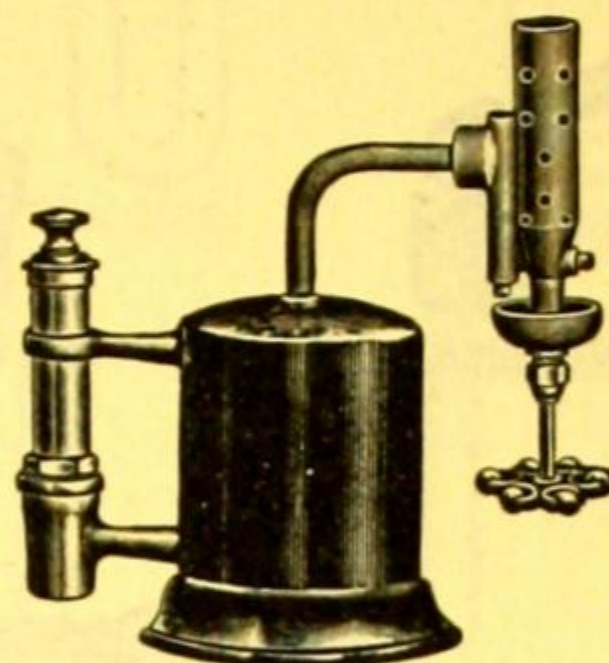
2156. **BURNER, Blast, Fletcher's Compound**, with range from a delicate pointed jet to a large brush flame; mounted on adjustable heavy cast base. Flame easily controlled by lever which adjusts both air and gas automatically. Especially valuable in glass working. For coal gas only. 12.50
2160. **BURNERS, Blast, Meker Type**, with short inlet tube for air. Height of burner, 135 mm; diameter of flame, 20 mm. For coal gas only. 4.80
- BURNERS, Blast, Brazing**, see Blowpipe No. 1444.
2170. **BURNERS, Alcohol Lamps**, of glass, with ground cap, wick and wick holder.
Capacity, ounces 4 8
Each \$0.3540
2172. **BURNERS, Alcohol Lamps**, of brass, with screw cap, wick and wick holder. Capacity 4 ounces.90
2173. **Burner Wicks**, for alcohol burners Nos. 2170 and 2172 per dozen .10
2174. **Burner Wick Holders**, brass, for No. 2170. per dozen .40
2175. **Burner Caps**, of glass, for No. 2170.
No. A B
For burner, ounces 4 8
Per dozen8080
2178. **BURNER, Alcohol Lamp**, of glass with nine facets on the font, enabling it to be placed in any position. Provided with wick 1/2 inch in diameter, giving a much hotter flame than ordinary alcohol lamps90
2179. **Burner Wicks** for No. 2178. per dozen .80
2182. **BURNER, Barthel's Automatic**, for alcohol; requires no wick; very powerful. Flame is equivalent to 2 Bunsen burners. Complete with 1 1/2 meters flexible steel tubing and reservoir of 1 liter capacity. Height, 182 mm; diameter of flame, 18 mm. 9.00
- 2186A. **BURNER, Barthel's Alcohol Stove**, enameled finish with brass reservoir; no wick required. Safe, smokeless; size of flame readily adjusted. Capacity of reservoir, 1/2 liter. 6.00
2192. **BURNER, Alcohol Stove**, of brass, nickel-plated, with invisible, indestructible wick. Very powerful, producing no smoke or odor. Weight, 8 ounces; capacity, 7 ounces. 1.00
2194. **BURNER, Alcohol Stove**, as used on Moisture Testers; noiseless, economical and safe. Burns with intensely hot, blue, smokeless flame for three hours on one charge. The best alcohol stove substitute for a broad gas flame. Flame adjustable in height. 4.00



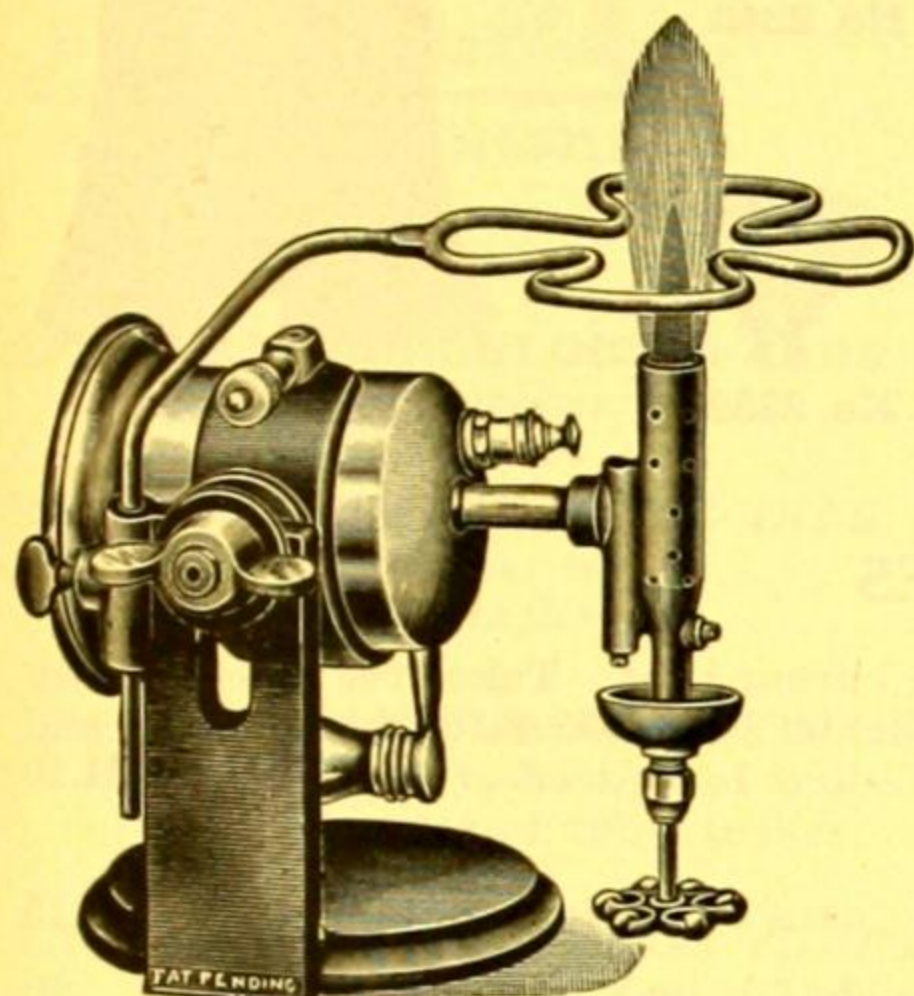
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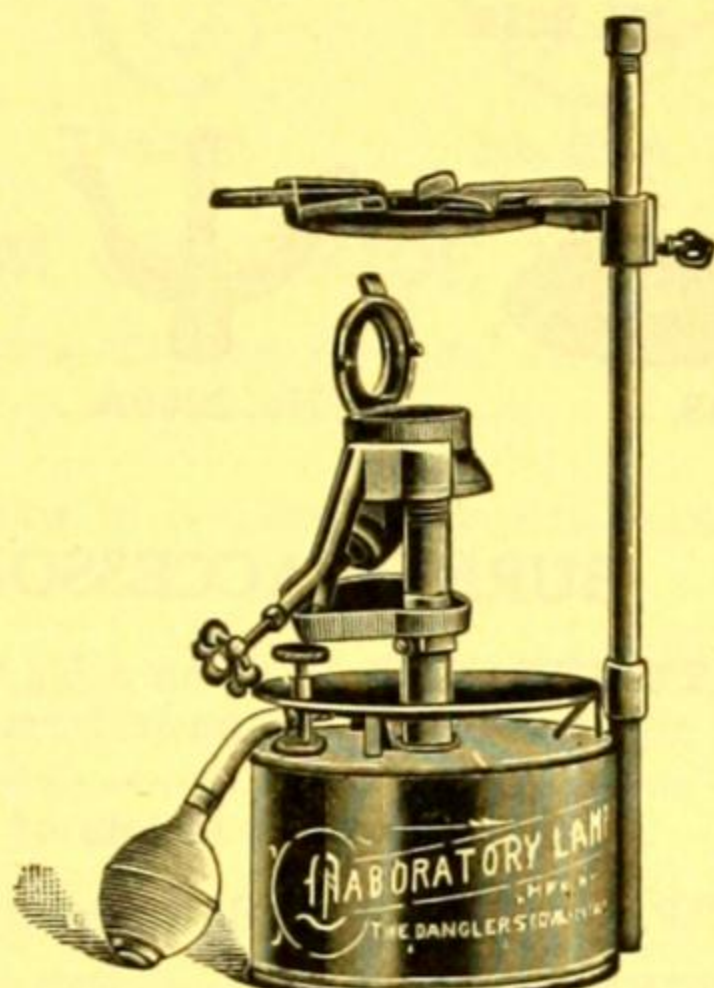
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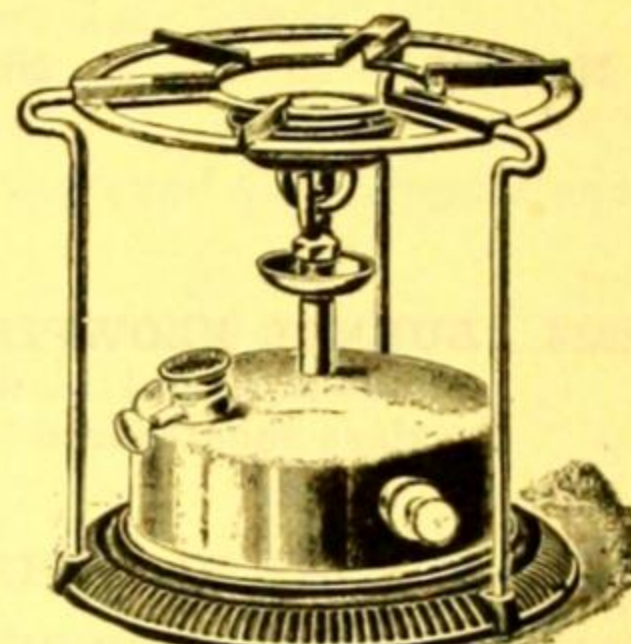
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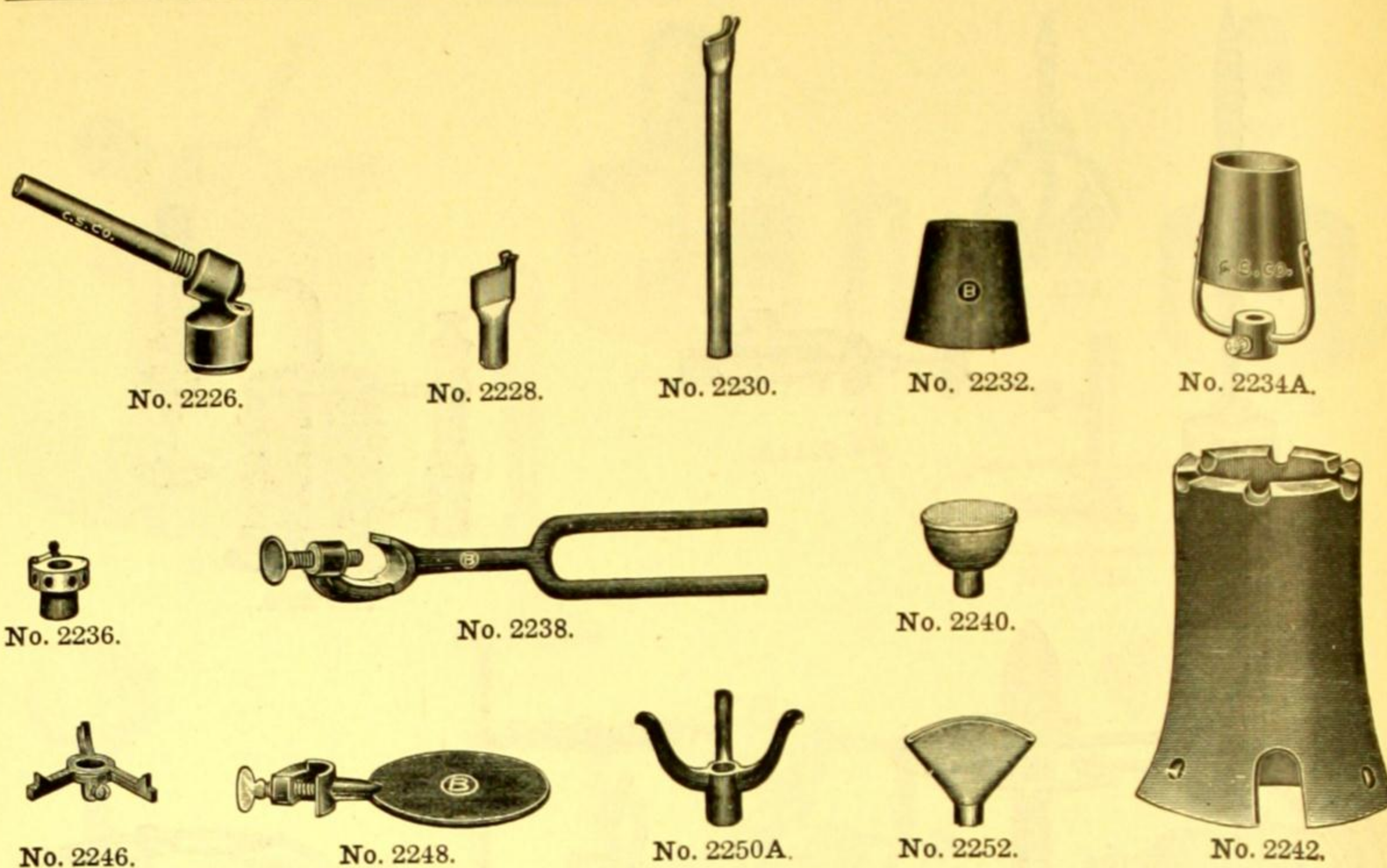
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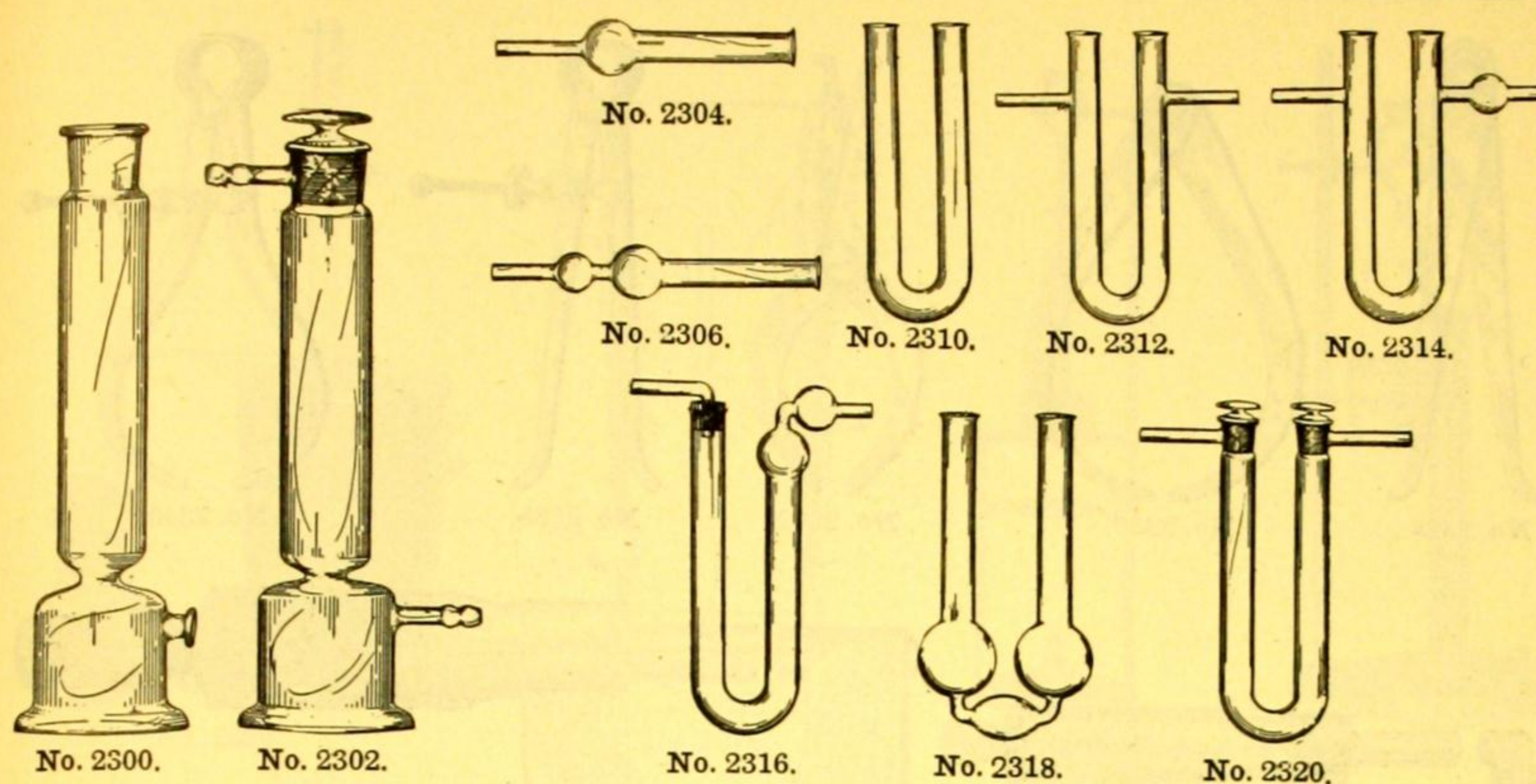
Burners, Gasoline and Kerosene.

2200. **BURNER, Baby Gasoline Torch**, of brass, nickel-plated. Fits the hand and can be used in any position. Automatic in action, without valves or pump. Burns two hours with one filling. Capacity of reservoir, $\frac{1}{4}$ pint. Height over all, $7\frac{1}{8}$ inches. \$1.90
10% discount in lots of 12.
- 2201G. **Wick and Strip**, only of No. 2200 for replacement15
Other repair parts can be supplied if desired and prices will be quoted upon request.
2206. **BURNER, Cenco Laboratory Blast Lamp**, for gasoline. The tank is of heavy seamless drawn brass, with brass pump in handle; the burner is of special bronze alloy. The flame is intensely hot, and can be regulated from small point to large brush. An excellent substitute for the Bunsen burner or gas blast lamp. Capacity of adjustable tank, 1 pint; total height of burner, 7 inches 7.25
2208. **BURNER, Cenco Adjustable Laboratory Blast Lamp**, for gasoline. Similar in construction to No. 2206, but mounted on swivel stand so that flame can be pointed in any direction, and raised or lowered. The pump is of brass mounted inside the tank and is automatic in action. Complete with adjustable tripod, which can be swung out of the way when not in use. 10.75
- 2211A. **Burner Body, Needle and Drip Cup**, for either No. 2206 or No. 2208, for replacement. 5.00
Other repair parts can be supplied if desired and prices will be quoted upon request.
2218. **BURNER, Dangler's Gasoline Blast Lamp**, flame easily adjustable. With tin reservoir, holding $\frac{1}{2}$ gallon. Complete with rubber pressure bulb. Height of burner, $10\frac{1}{2}$ inches; height to top of support rod, 17 inches; diameter of reservoir, 7 inches. 14.50
- BULBS, Rubber**, for No. 2218, see No. 11530.
2222. **BURNER, Kerosene Stove**, wickless, giving hot, blue flame, without smoke or odor. Height, $8\frac{3}{4}$ inches; diameter of base, 9 inches. With removable tripod. 7.00



BURNER ACCESSORIES

2226. **BURNER BLOWPIPE ATTACHMENT**, to fit on a $\frac{7}{16}$ inch burner tube. Takes the place of both blowpipe and blowpipe tip, leaving both hands free. Should be used with rubber tube and glass mouthpiece \$1.10
10% discount in lots of 12.
2228. **BURNER BLOWPIPE TIP**, with rest, for blowpipe, fitting outside $\frac{7}{16}$ inch burners..... .15
2230. **BURNER BLOWPIPE TUBE**, for yellow flame, fitting inside $\frac{7}{16}$ inch burners..... .20
2232. **BURNER CHIMNEY**, of Russia iron, to protect flame from drafts, for use with No. 2246 Star Support. Diameter at bottom, 2 inches; at top, $1\frac{1}{2}$ inches; height, 2 inches..... .12
- 2234A. **BURNER CHIMNEY**, of Russia iron, with attached support, for $\frac{7}{16}$ inch burners..... .80
2236. **BURNER CROWN TOP**, giving round flame, for heating dishes; diameter, 1 inch; for $\frac{7}{16}$ inch burner50
2238. **BURNER FORK** for attaching burner to ring stand30
2240. **BURNER GAUZE TOP**, giving large round flame; diameter, $1\frac{1}{2}$ inches; for $\frac{7}{16}$ in. burners30
2242. **BURNER GUARD**, of vitrified earthenware for protecting a flame from drafts. Will also be found a rigid and convenient support, measuring 9 inches high, 8 inches diameter at base, 5 inches diameter at top. Provided with hole for rubber tubing and inlets for air to support combustion70
2246. **BURNER STAR** for supporting No. 2232 Chimney, for $\frac{7}{16}$ inch burners..... .25
2248. **BURNER SUPPORTS**, of iron, with heavy screw for clamping on supports or tripods.
- | | | |
|------------------------|----------------|-----|
| No. | A | B |
| Diameter, inches | $3\frac{1}{2}$ | 5 |
| Each | .35 | .50 |
- 10% discount in lots of 12.
- 2250A. **BURNER TRIPOD** for holding dishes, measuring $2\frac{1}{2}$ inches between supporting points, for $\frac{7}{16}$ inch burners22
- BURNER TUBING**, see Rubber Tubing.
2252. **BURNER WING TOPS** for use in bending glass tubing.
- | | | |
|--|----------------|---------------|
| No. | A | B |
| For burner tube, diameter, inches..... | $\frac{7}{16}$ | $\frac{1}{2}$ |
| Each | .10 | .16 |
- 10% discount in lots of 12, 25% discount in lots of 144.



CALCIUM CHLORIDE TUBES

2300.	CALCIUM CHLORIDE JARS, Drying Towers, on foot, with tubulature near bottom.		
	Height, inches	8	10
	Each	\$1.10	1.20
2302.	CALCIUM CHLORIDE JARS, similar to No. 2300, but with perforated ground glass stopper and side tube near top.		
	Height, inches	10	12
	Each	3.10	3.70
2304.	CALCIUM CHLORIDE TUBES, one bulb, straight delivery tube.		
	Length to bottom of bulb, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.10	.12
2306.	CALCIUM CHLORIDE TUBES, two bulbs, straight delivery tube.		
	Length to bottom of first bulb, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.15	.20
2310.	CALCIUM CHLORIDE TUBES, U shape, plain.		
	Length, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.16	.20
2312.	CALCIUM CHLORIDE TUBES, U shape, with side tubes.		
	Length, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.30	.32
2314.	CALCIUM CHLORIDE TUBES, U shape, with side tubes and bulb on one.		
	Length, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.25	.35
2316.	CALCIUM CHLORIDE TUBE, Marchand's, with cork and connecting tube. Length, 6 inches; diameter, $\frac{5}{8}$ inch.		
			.50
2318.	CALCIUM CHLORIDE TUBES, Peligot's, U shaped, with three bulbs.		
	Length, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.40	.50
2320.	CALCIUM CHLORIDE TUBES, Schwartz, with side tubes and perforated ground in glass stoppers.		
	No.	A	B
	Length, inches	4	6
	Diameter of tube, inches	$\frac{5}{8}$	$\frac{3}{4}$
	Each	.90	1.20

10% discount in lots of 12.

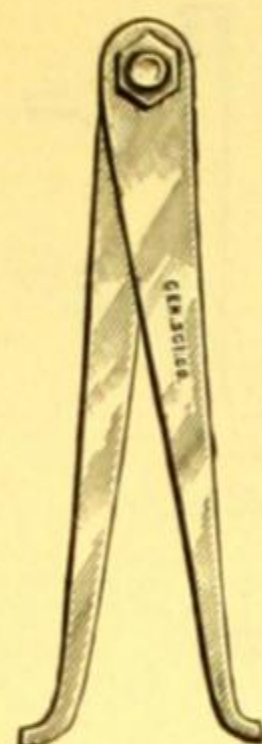
CALIBRATING BURETTES, see Burettes.

CALIBRATING PIPETTES, see Pipettes.

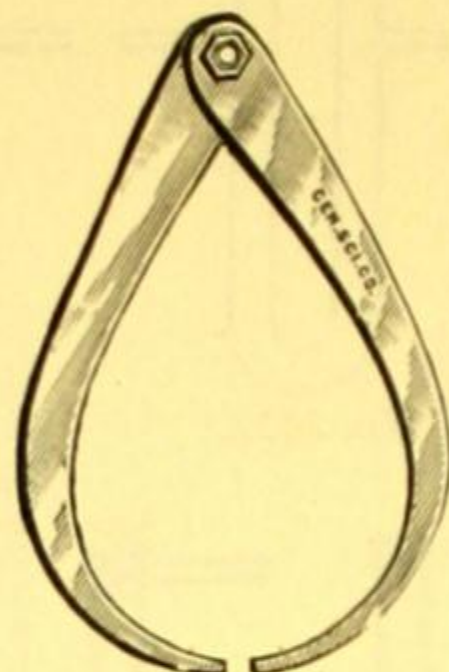
Note.—10% discount in lots of 12, 25% discount in lots of 144, on Nos. 2304 to 2318 inclusive.

CALIPERS

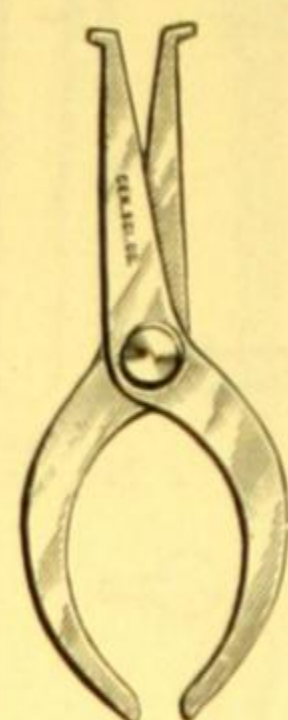
CENTRAL SCIENTIFIC CO., CHICAGO. U. S. A.



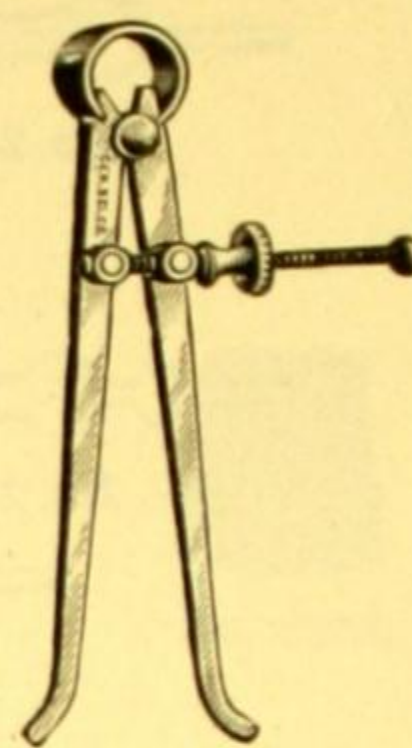
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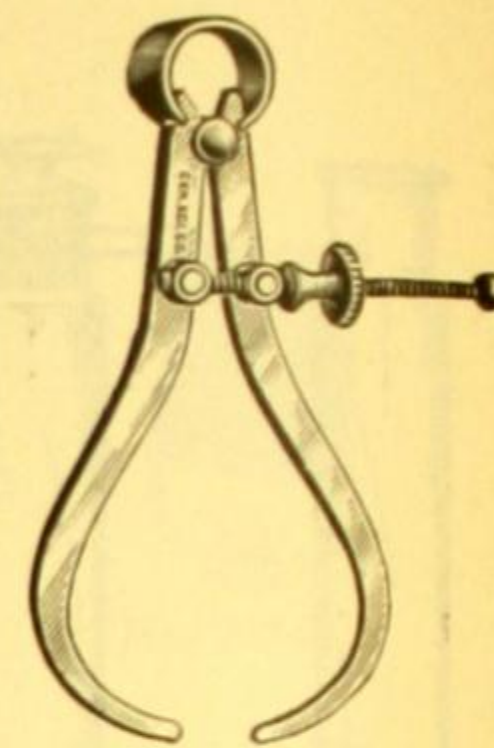
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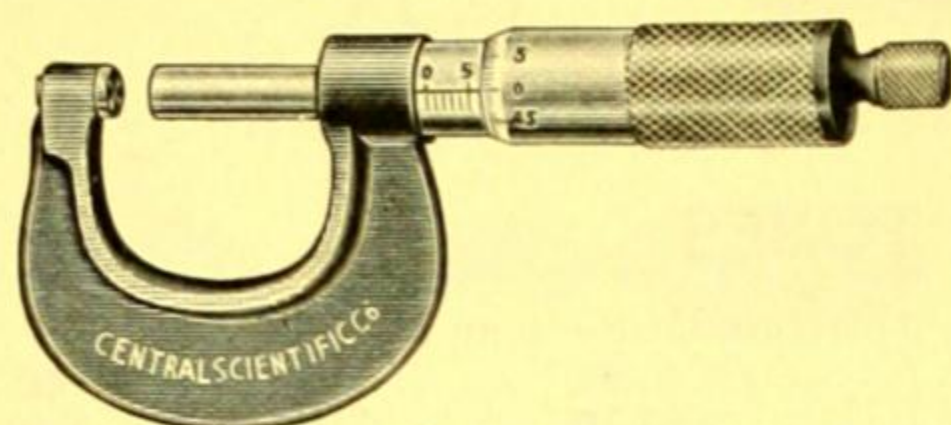
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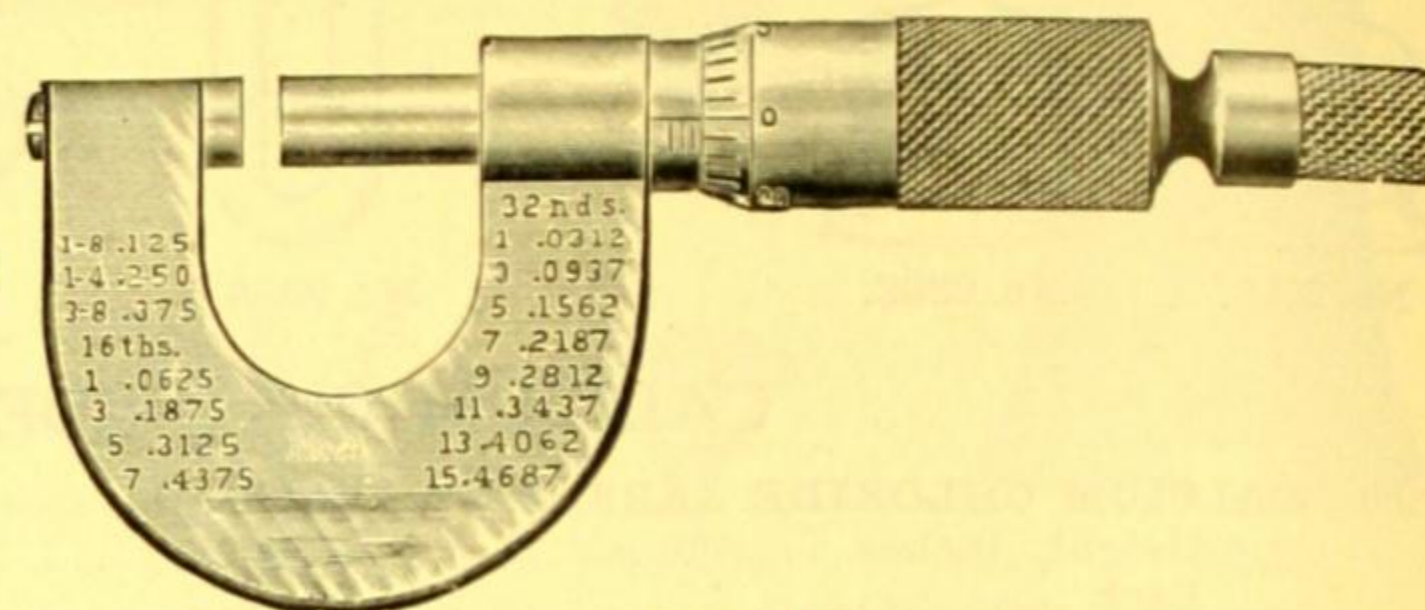
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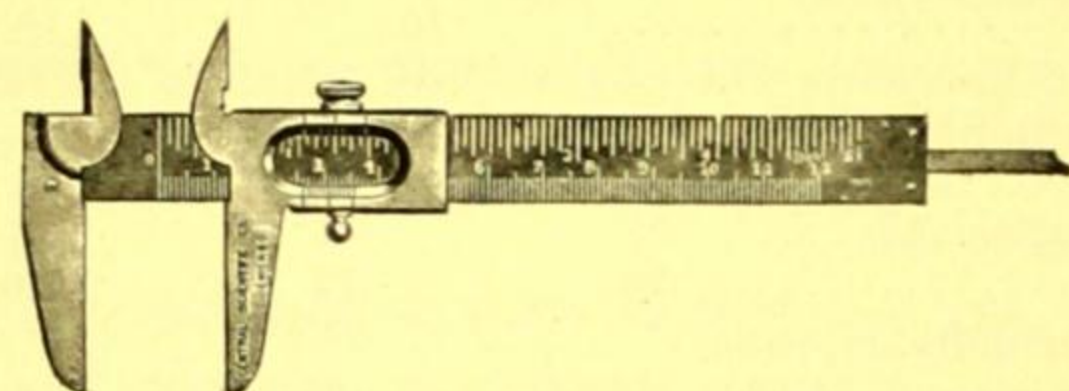
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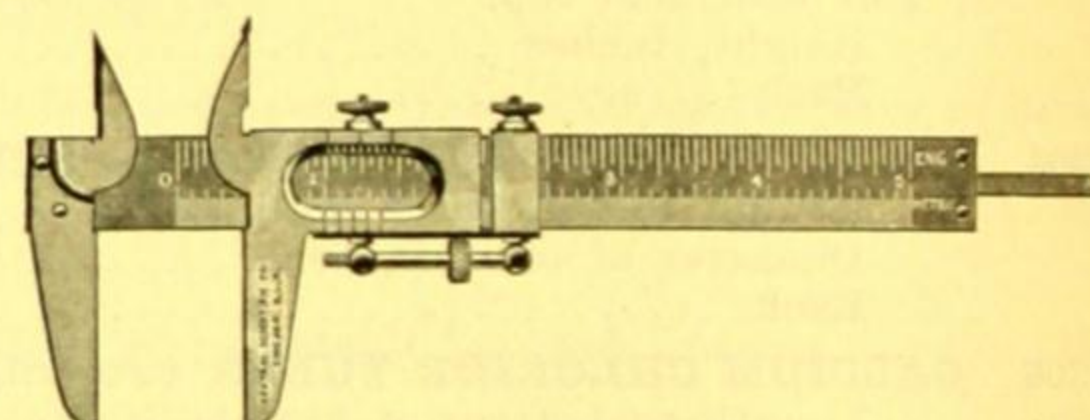
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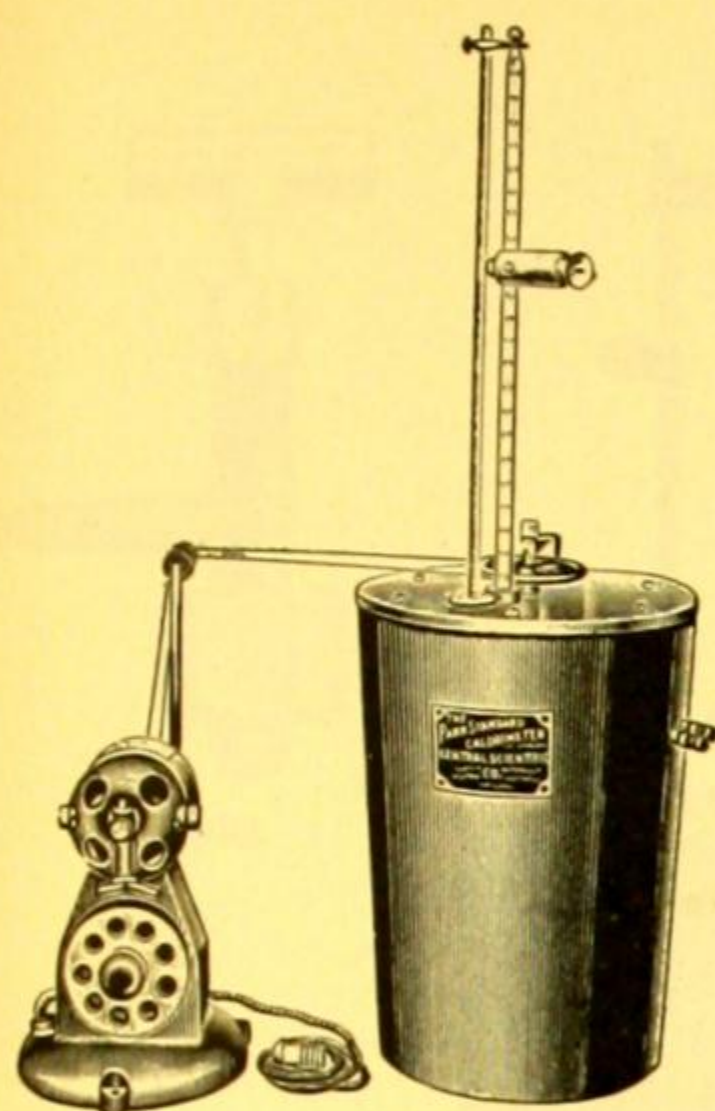


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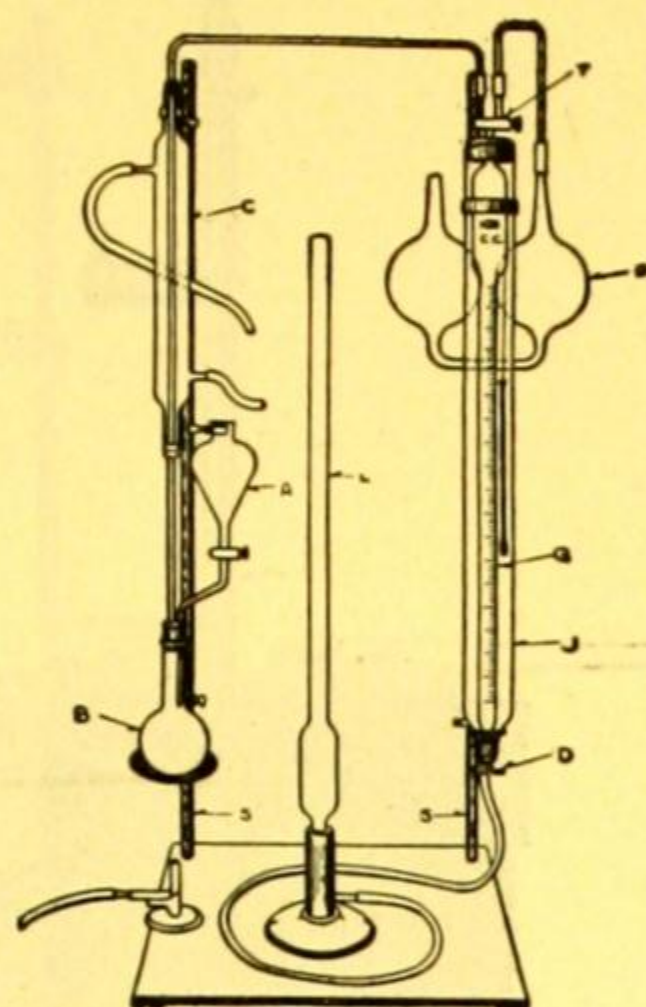


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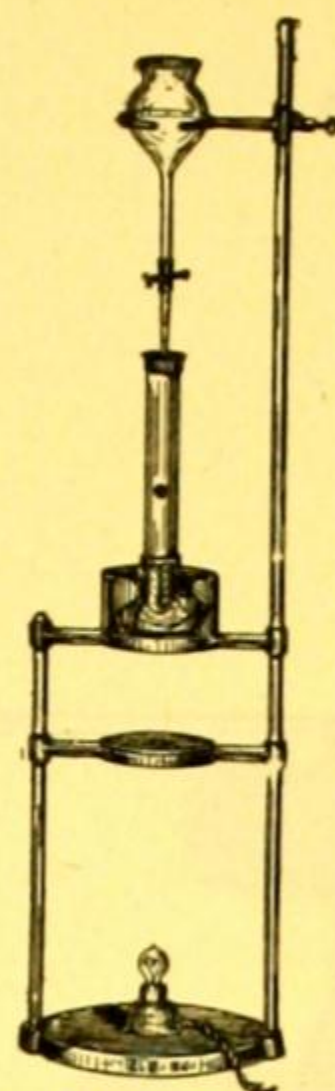
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|-------|---|--------|
| 2328. | CALIPER, Inside. Polished steel. Length, 15 cm..... | \$0.35 |
| 2330. | CALIPER, Outside. Polished steel. Length 15 cm..... | .35 |
| 2332. | CALIPER, Double. Inside and outside. Polished steel. Length, 15 cm..... | .50 |
| 2338. | CALIPER, Spring, Inside. Even tension, solid nut. Polished steel. Length, 12.5 cm..... | 1.20 |
| 2340. | CALIPER, Spring, Outside. Even tension, solid nut. Polished steel. Length, 12.5 cm... | 1.20 |
| 2342. | CALIPER, Micrometer, Metric. This caliper will measure all sizes up to 25 mm, and is graduated to read to 0.01 mm. It is provided with a friction head so that all measurements are made with the same degree of pressure..... | 6.00 |
| 2344. | CALIPER, Micrometer, Metric, for measurements up to 25 mm, graduated to read to 0.01 mm. Provided with a ratchet stop, same as No. 2348 | 8.00 |
| 2348. | CALIPER, Micrometer, English, for measurements up to 1 inch, graduated to read to 0.001 in. Provided with ratchet stop..... | 8.00 |
| 2352. | CASE for Micrometer Caliper, covered with morocco leather and lined with velvet. Will hold either No. 2344 or No. 2348..... | 1.00 |
| 2354. | CALIPER, Vernier, of steel; length, over 16 cm; the most complete vernier caliper on the market. Inside caliper, outside caliper and depth gauge combined. Graduated to 5 inches in 16th inch divisions and to 12 centimeters in millimeter divisions; reading by verniers to 1/128 inch and 1/10 millimeter. Thumb attachment for easy operation. Neat, accurate and durable | 2.50 |
| 2356. | CALIPER, Vernier, of steel, same as No. 2354 with the addition of a micrometer screw adjustment. | 3.00 |
| 2357. | CASE for Vernier Caliper, leather. Will hold either No. 2354 or No. 2356..... | .60 |



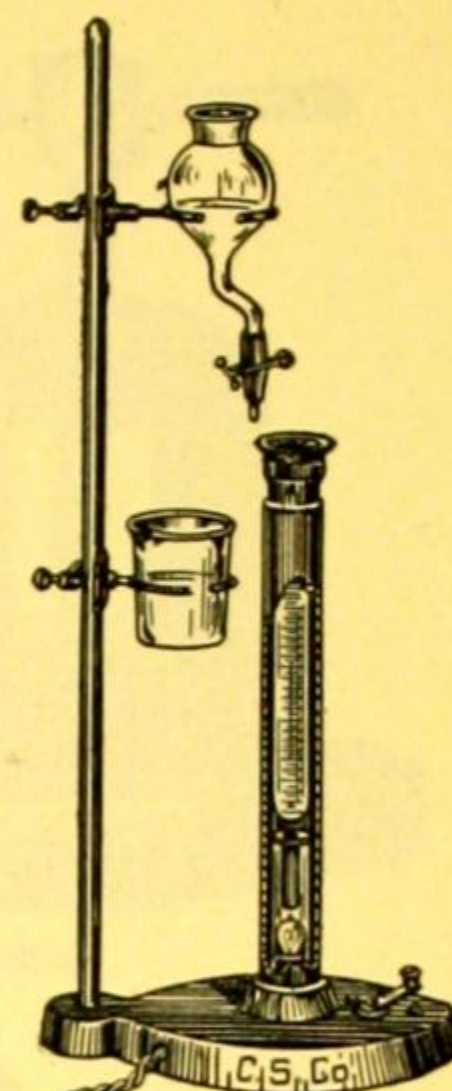
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No. 2376.



No. 2378.



No. 2380.

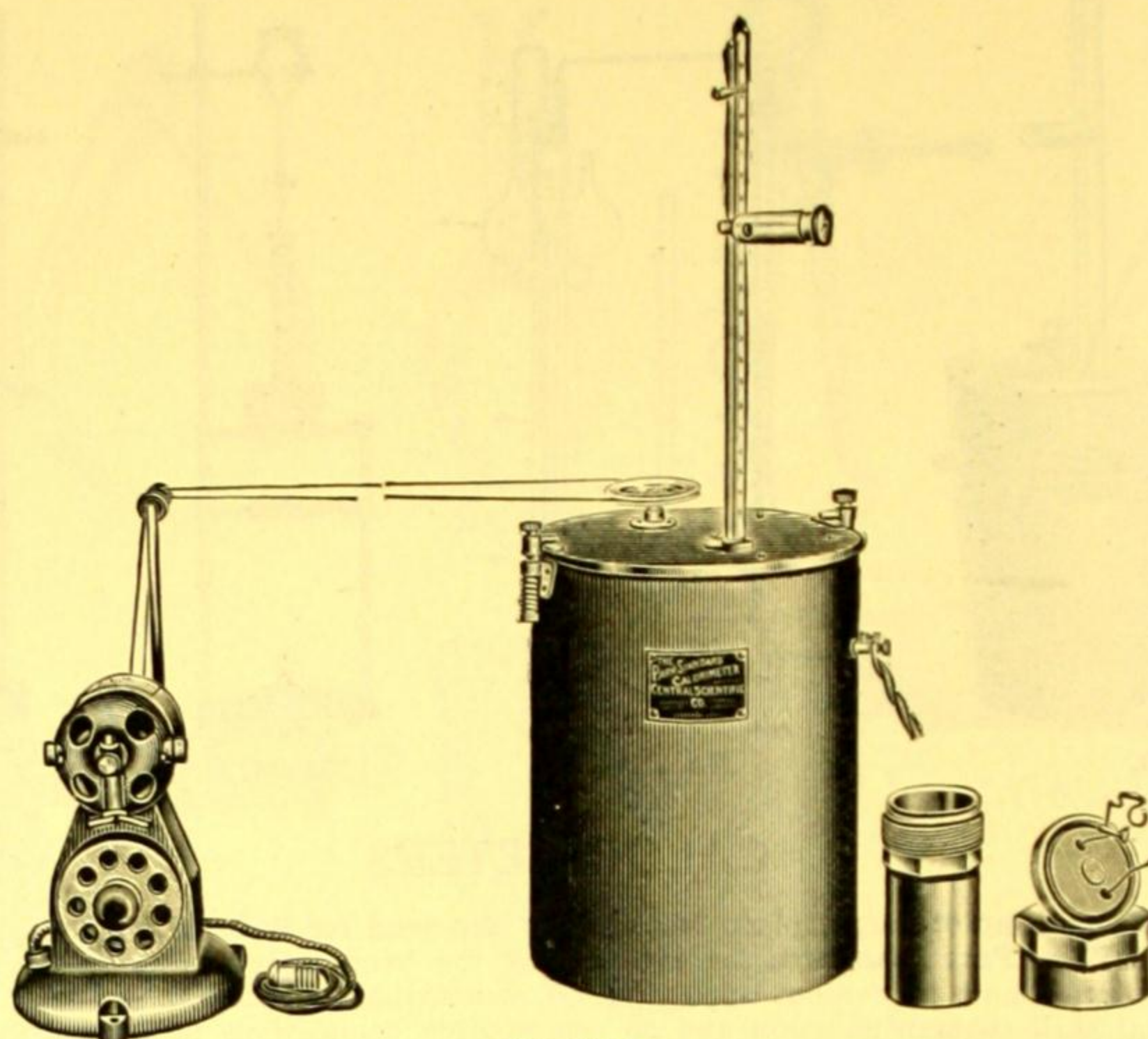
CALORIMETERS

(For complete description of the Parr line send for Bulletin No. 73.)

2360. **CALORIMETER**, Parr Standard, for determining the heat units in coal, coke, lignite and oils. The most rapid and convenient apparatus for measuring the calorific power of fuels. Requires no special skill in manipulation and no complicated connections to oxygen tanks, etc. Outfit is readily portable, being self-contained. Requires power to operate stirrer, which can be furnished by electric motor. Determinations can be quickly made, requiring not more than 20 minutes to complete a test on a prepared sample. The bomb or combustion cup furnished is made of a special alloy which resists the action of the melted sodium peroxide, and can be used continuously. An arrangement is made whereby the water is not admitted to contact with the bomb until the fusion is completed, thus insuring the complete combustion of the sample. A further advantage of this calorimeter is the fact that sulphur and total carbon may be easily determined from the fused product of the combustion by the Sulphur Photometer (see No. 2378), and the Total Carbon Apparatus (see No. 2376). Two interchangeable fusion cups are furnished enabling duplicate determinations to be made. Complete with thermometer reading from 65° to 90° F. in $\frac{1}{20}^{\circ}$ divisions with Bureau of Standards certificate, reading lens with support, two-liter measuring flask, chemical receptacle, measuring cup, 100-mesh 5 inch brass sieve with bottom, forceps, camel hair brush, ignition wire and chemicals sufficient for fifty determinations, but without motor. \$90.00

Accessories and Parts for Parr Standard Calorimeter

2361. **Electric Motor**, variable speed, for 110 volts A. C. or D. C. mounted on support. 27.00
 2362. **Electric Motor**, variable speed, for 220 volts A. C. or D. C. mounted on support. 27.00
 13533A. **Thermometer**, 65° to 90° F., in $\frac{1}{20}^{\circ}$ divisions, with Bureau of Standards certificate. . . . 12.00
 13533B. **Thermometer**, 65° to 105° F., in $\frac{1}{20}^{\circ}$ divisions, with Bureau of Standards certificate. . . . 15.00
 4967G. **Rheostat**, Cenco, for 110 volt circuit, for use with lighting circuit to reduce voltage to safe limit for ignition. Resistance, 44 ohms; current, 3.1 amperes. 6.00
 4967F. **Rheostat**, Cenco, for 220 volt circuit. Resistance, 89 ohms; current, 2.2 amperes. 6.00
 2367. **Ignition Wire** for electric ignition. per card .60
 2368. **Bomb for Electric Ignition**, complete with wrenches 35.00
 13730. **Reading Lens**, with support. 2.25
 2370. **Benzoic Acid**, for standardizing. per 2 ounce bottle 1.50
 2371. **Sodium Peroxide**, a special quality put up for use with the Parr Calorimeter, in metal container.
 Size, pounds $\frac{1}{4}$ $\frac{1}{2}$ 1
 Each75 1.25 2.00
 2372. **Accelerator** per 2 ounce bottle .55
 2373. **Gaskets for bomb**. per dozen .40
SULPHUR BOMBS, Parr, for sulphur determination in coal, coke or oils made independently of the calorimetric process, see under general heading **Sulphur Determination Apparatus**.
 2376. **TOTAL CARBON APPARATUS**, Parr, for total carbon in coal, coke, etc., in connection with the Parr Standard Calorimeter. By adding acid to the dissolved residue from the combustion, which appears as sodium carbonate, carbon dioxide is liberated and measured under proper conditions. Complete with full directions for use 52.00
 2378. **SULPHUR PHOTOMETER**, Parr, for determining the percentage of sulphur in coal, coke and petroleum. For description see under general heading **Sulphur Determination Apparatus** 30.00
 2379. **Barium Oxalate** for use with No. 2378. per 2 ounce bottle .75
 2380. **SULPHUR PHOTOMETER**, Parr, simplified form. For description see under general heading **Sulphur Determination Apparatus**. 22.00

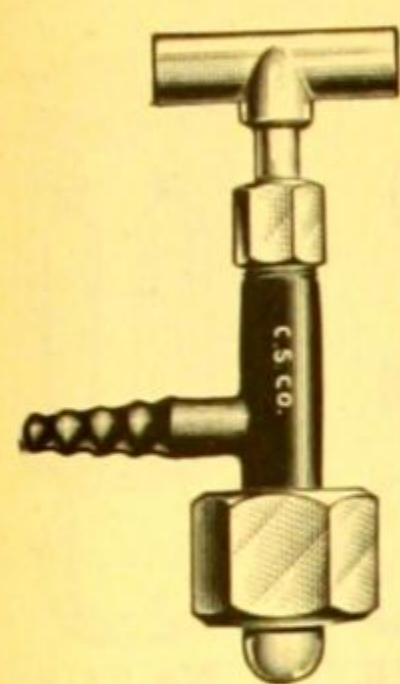


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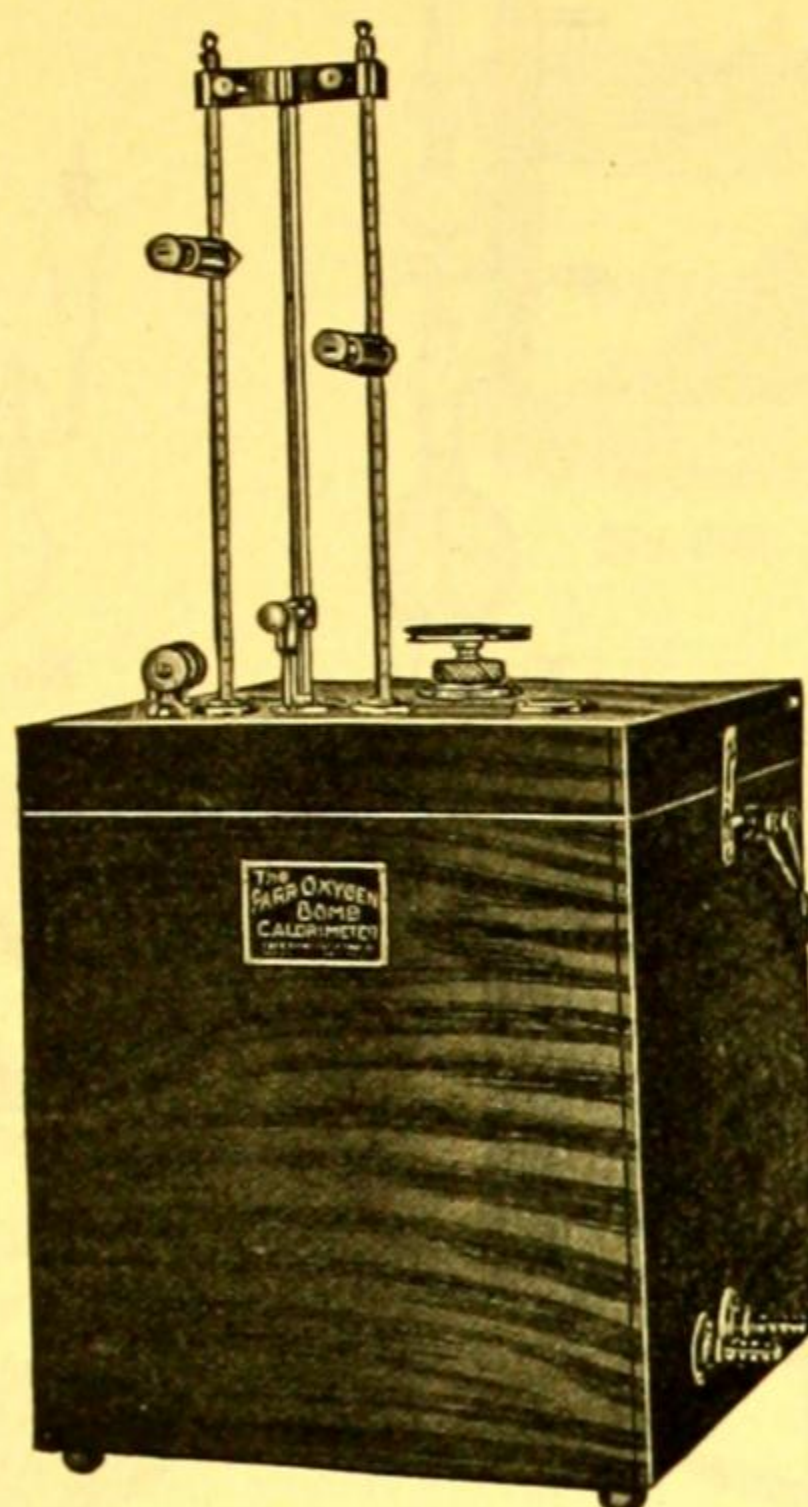
2382. **CALORIMETER, Parr Oxygen Bomb**, a new instrument of the Berthelot-Mahler type with a bomb made of the new acid-resisting alloy Illium. This metal has proved by means of tests extending over several years to be equivalent to or better than platinum for calorimetric work. This feature renders unnecessary any costly lining of gold or platinum, and consequently makes the Parr outfit the most economical of the bomb calorimeters recognized as standard. The new bomb is also entirely free from the corrosion to which the platinum-lined steel bombs are subject, and eliminates the annoyance due to the chipping and cracking of the enamel in porcelain-lined bombs. A rubber gasket is substituted for the lead of the old type, and a check valve with rubber seat replaces the needle valve. The calorimeter can is oval in shape permitting the use of a rotary stirrer which quickly distributes the heat and obviates any temperature lag. Complete with Illium bomb, water container, insulating vessel of indurated fibre with cover of same, rotary stirrer, pressure gage and needle valve with oxygen connection and couplings, octagon socket for bomb, spanner wrench, six capsules of special alloy, reading lens and support, special ignition wire and gaskets, but without thermometer or motor. (See Report of the Joint Committee of the American Chemical Society and American Society for Testing Materials, in the Journal of Industrial and Engineering Chemistry, Vol. IX, No. 1, for January 1917) \$300.00

Accessories and Parts for Parr Oxygen Bomb Calorimeter.

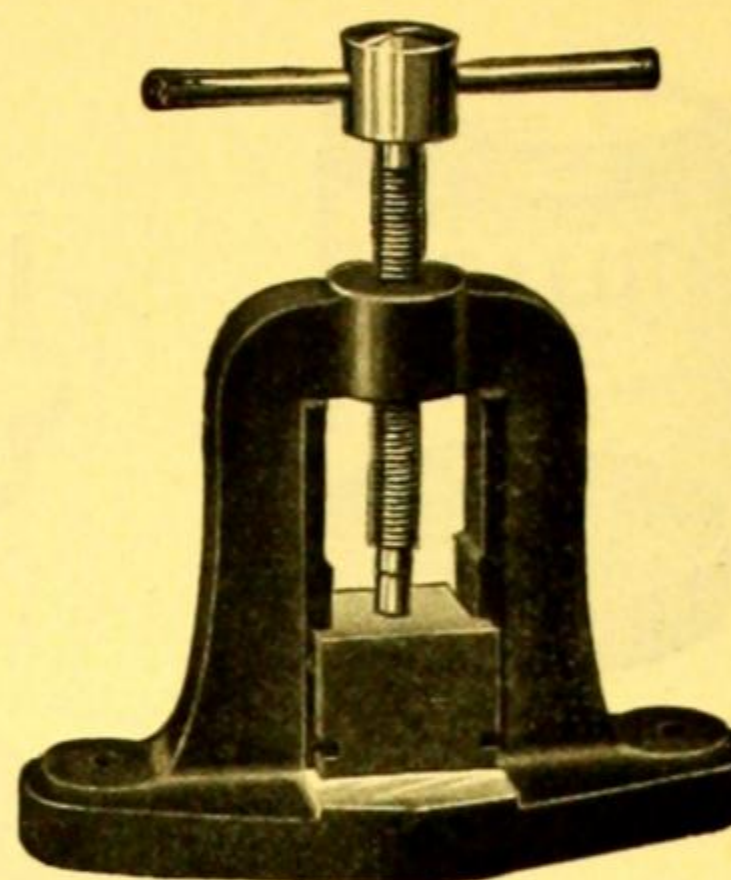
2361. Electric Motor, variable speed, for 110 volts A. C. or D. C.....	27.00
2362. Electric Motor, variable speed, for 220 volts A. C. or D. C.....	27.00
13533A. Thermometer, 65° to 90° F., in $\frac{1}{20}^{\circ}$ divisions, with Bureau of Standards certificate.....	12.00
13533B. Thermometer, 65° to 105° F., in $\frac{1}{20}^{\circ}$ divisions, with Bureau of Standards certificate.....	15.00
13519. Thermometer, Beckmann Differential, with range of 5 to 6 degrees graduated to $\frac{1}{100}^{\circ}$ C., with Bureau of Standards certificate.....	30.00
2384. Bomb only of Illium alloy.....	225.00
2384A. Gaskets only for No. 2384 Bomb.....	per dozen 1.00
2387. Pressure Gage, with needle valve, oxygen connections and couplings.....	26.00
13730. Reading Lens, with support.....	2.25
2367. Ignition Wire	per card .60
2390. Gaskets for Valve.....	per dozen .90
2391. Gaskets for Union.....	per dozen .50
2392. Capsules, of Illium alloy.....	each 3.75



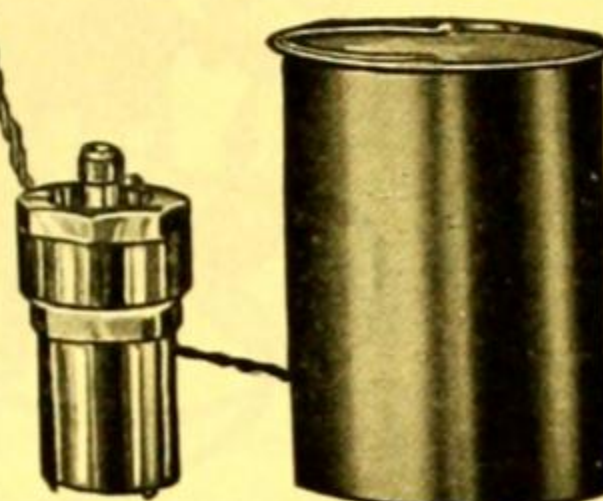
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No. 2394.



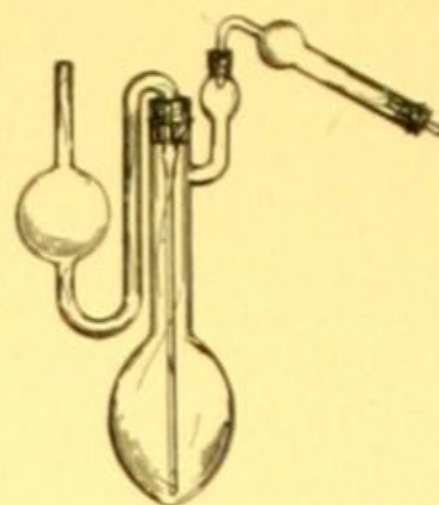
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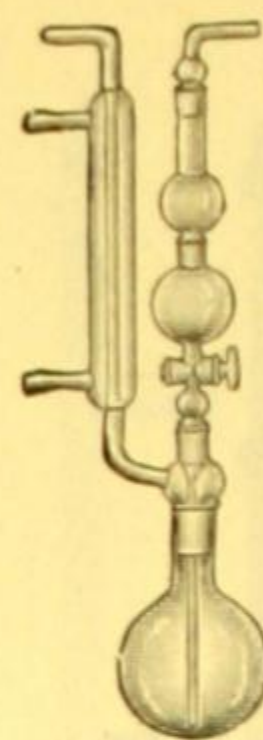
2394. **CALORIMETER, Parr Adiabatic Oxygen Bomb.** An entirely new adiabatic system is employed which insures a degree of accuracy not possible with pneumatic or vacuum methods. Water is kept circulating constantly throughout the cover and on all sides of the jacket, the temperature of which is under the positive control of the operator. By turning the proper valve, either cooler or warmer water is instantly admitted and immediately distributed throughout the jacket permitting the operator to keep the temperature controlled in either direction to correspond absolutely with that in the calorimeter proper. This is a feature not found in any other commercial calorimeter. By this means errors due to radiation or to conductivity lag are eliminated and the use of calculations made unnecessary. The cover is pivoted so that it swings out of the way in a horizontal plane, carrying the thermometer with it, thus reducing the danger of breakage to a minimum. The water container and bomb are the same as those employed in the Oxygen Bomb Calorimeter No. 2382. Complete with water container, Illum bomb, adiabatic water jacket, rotary stirrers, pressure gage and needle valve with oxygen connection and couplings, octagon socket for bomb, spanner wrench, six capsules of special alloy, reading lens and support, special ignition wire and gaskets, but without thermometer, motor, heater, or heater burner..... \$400.00
2361. **Electric Motor**, variable speed, for 110 volts A. C. or D. C..... 27.00
2362. **Electric Motor**, variable speed, for 220 volts A. C. or D. C..... 27.00
- Note.**—A gas burner and hot water heater can be supplied for use with No. 2394 if desired. Prices will be quoted on application.
- For other parts, see those listed under **Parr Oxygen Bomb Calorimeter No. 2382.**
- Note.**—If desired by those who are accustomed to using only platinum lined bombs, we shall be glad to quote prices on a special platinum lined Illum bomb. The advantages of this over the usual platinum lined steel bomb are obvious.
2400. **PELLET PRESS and Mold**, complete, for preparing fuel pellets for calorimetric determinations..... 24.00
6549. **NEEDLE VALVE**, for Combustion Work, constructed to make possible the drawing off of gases from high pressure oxygen cylinders at an even rate and at such a moderate speed as to make it easily possible to count the bubbles passing through an absorption train..... 5.00
- OXYGEN CYLINDERS** for use with Oxygen Bomb Calorimeter, see **Gas, Oxygen.**
- CALORIMETERS, Gas**, see **Gas Analysis Apparatus.**
- CANS, Sample**, see **Boxes.**



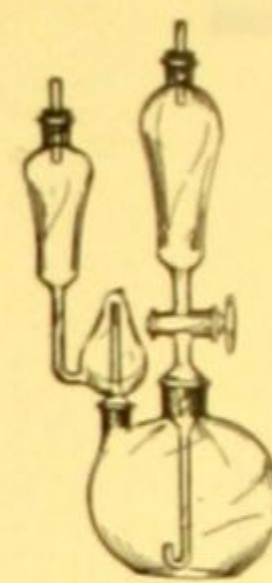
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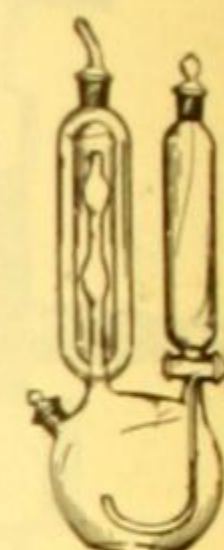
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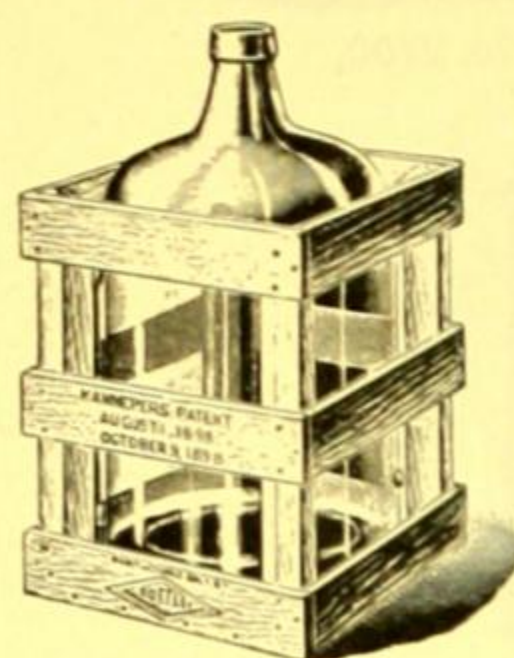
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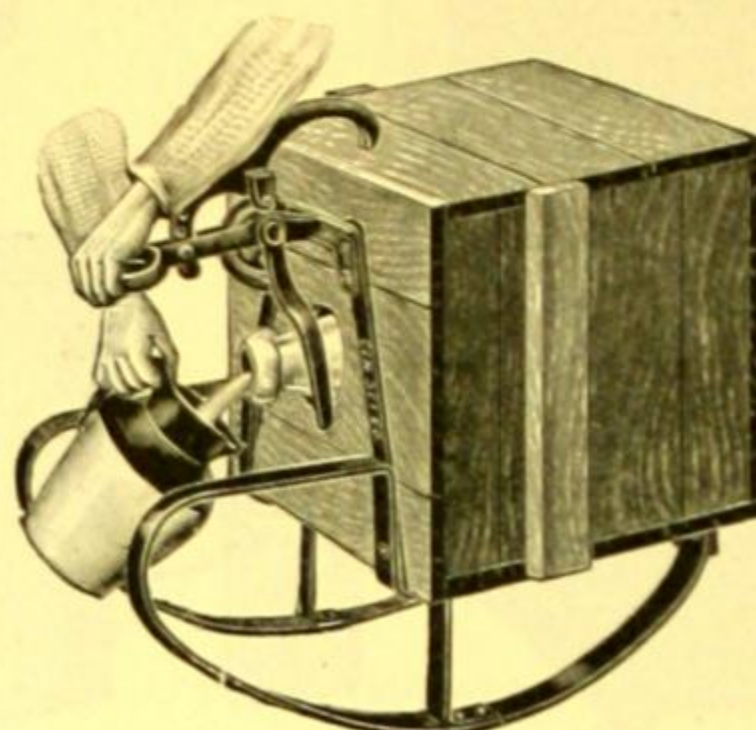
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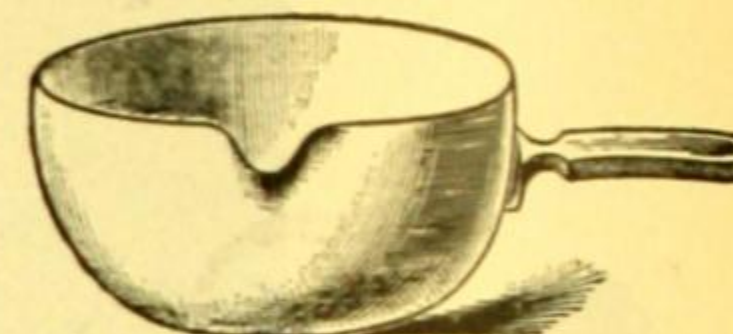
No. 2418.



No. 2422.



No. 2426 (shown in use).



No. 2428.



No. 2432.

2408. CAPSULES, Coors Porcelain, as used in milk analysis, ash determination in flour, etc. With straight sides and flat bottom, glazed throughout. Capacity, 25 cc; diameter, 69 mm; height, 13 mm \$0.42

CAPSULES, Combustion, see Combustion Capsules.

CARBON BATHS, see Water Baths.

CARBON DISSOLVING TUBES, see Test Tubes.

CARBON DIOXIDE DETERMINATION APPARATUS

2412. CARBON DIOXIDE APPARATUS (Alkalimeter), Bunsen's 1.30
2414. CARBON DIOXIDE APPARATUS (Alkalimeter), Knorr's, for determination of carbonic acid in carbonates, especially baking powder, recommended by the Association of Official Agricultural Chemists. All joints are ground together..... 12.00
2416. CARBON DIOXIDE APPARATUS (Alkalimeter), Mohr's, with two ground joints..... 4.00
2418. CARBON DIOXIDE APPARATUS (Alkalimeter), Schroedter's, with tube in flask..... 4.00
- CARBON FILTER TUBES, see Filter Funnels.
2422. CARBOY, Glass, in rubber cushioned crate, capacity 5 gallons..... 3.00
2426. CARBOY INCLINATOR, Flaherty's. A lever locks the carboy to the inclinator, and on account of the shape of the rockers the carboy always returns to an upright position when released. A very convenient method of tilting a heavy carboy 10.00
2427. CARDBOARD, Bristol Board, best quality for drawing, in sheets 11x14 inches.. Each .05
Per dozen .50
2428. CASSEROLES, Coors Porcelain, with lip and porcelain handle, glazed with exception of rim.
- | No. | 1 | 2 | 3 | 3A | 4 | 4A | 5 | 6 | 7 |
|--------------|-----|-----|-----|-----|------|------|------|------|------|
| Capacity, cc | 30 | 75 | 150 | 210 | 375 | 500 | 750 | 1250 | 2000 |
| Diameter, mm | 50 | 70 | 85 | 95 | 110 | 133 | 140 | 165 | 175 |
| Height, mm | 25 | 35 | 45 | 50 | 62 | 68 | 88 | 95 | 130 |
| Each | .42 | .48 | .60 | .84 | 1.08 | 1.38 | 1.68 | 2.40 | 4.20 |
2432. CASSEROLES, Agateware, with handle.
- | Manufacturer's rated capacity, ounces | 32 | 64 |
|---------------------------------------|-----|-----|
| Each | .35 | .40 |
- CATHETOMETERS, see Catalog F of Physical Apparatus.



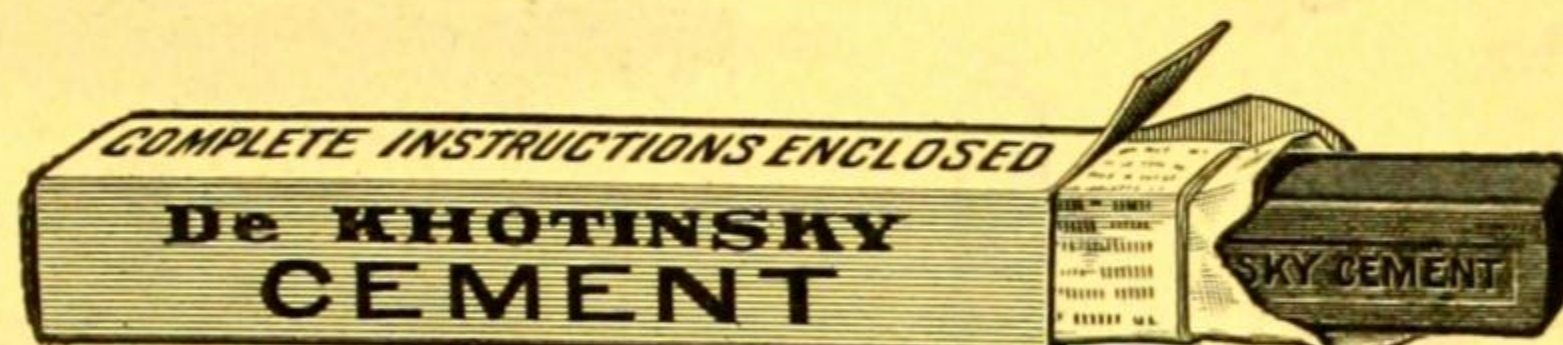
No. 2436.



No. 308.



No. 2445.



Nos. 2440-2.

CEMENT, ALUNDUM REFRACTORY, for use in repairing mufflers, cores, electric furnaces, and in general wherever a refractory cement of high thermal conductivity is desirable. Used extensively for covering resistance wire in electric furnaces. When mixed with water to make a thick paste it is ready for use. Furnished in three mixtures, RA 162 for general work, RA 355 where a fine grained cement is required, and RA 305, for use where a cement with a vitrifying point of 500°C. is needed. Unless specified when ordering, mixture RA 162 will be furnished.

	In lots of, pounds.....	1	5
2436A.	Mixture RA 162.....	\$0.30	1.25
2436B.	Mixture RA 355.....	.40	1.60
2436C.	Mixture RA 305.....	.50	2.00

308. **CEMENT, ASBESTOS (Retort Cement)**, fire and acid proof, for use with muffles, retorts, electric furnaces, etc. Put up in cans ready for use.

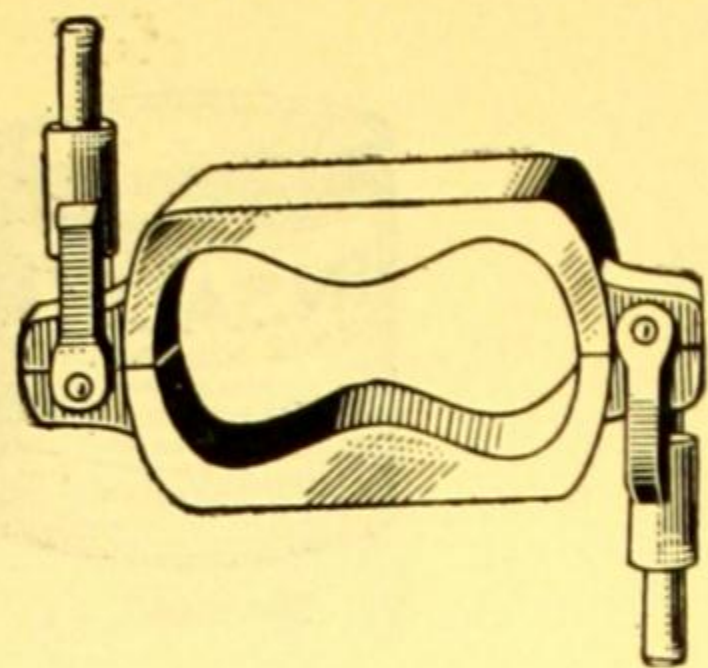
	Weight, pounds	1	5
	Each	.50	1.35

CEMENT, De Khotinsky Laboratory. This well-known cement is not attacked by water, sulphuric, nitric or hydrochloric acids, bisulphide of carbon, benzene, gasoline or turpentine, and is very little affected by ether, chloroform, caustic alkalies, etc. Comes in small sticks of about 1 oz., large sticks of about 2 oz. and in bulk by the pound. Prepared in three different grades as follows: **Hard** for cementing glass, metal and porcelain; **medium** for cementing and insulating purposes; **soft** for insulating and covering electric wires, for condensers, static machines, protection against corrosion and for cementing rubber, hard rubber, wood, ivory, etc.

No.		A	B
	Size	Small Stick	Large Stick
2440.	CEMENT, De Khotinsky Laboratory, Hard.....	.70	1.40
2441.	CEMENT, De Khotinsky Laboratory, Medium.....	.70	1.40
2442.	CEMENT, De Khotinsky Laboratory, Soft.....	.70	1.40
2445.	CEMENT, Insalute , a fire-proof insulating cement which will adhere to metal, porcelain and glass. When baked in an oven, it becomes very hard and cannot be removed without breaking into pieces. In this condition it is unaffected by heat, water or other solvents and forms an excellent electrical insulator for connections which are exposed to heat. In one pound cans, with directions for use.....		.45

CEMENT, Rubber, see Rubber Cement.

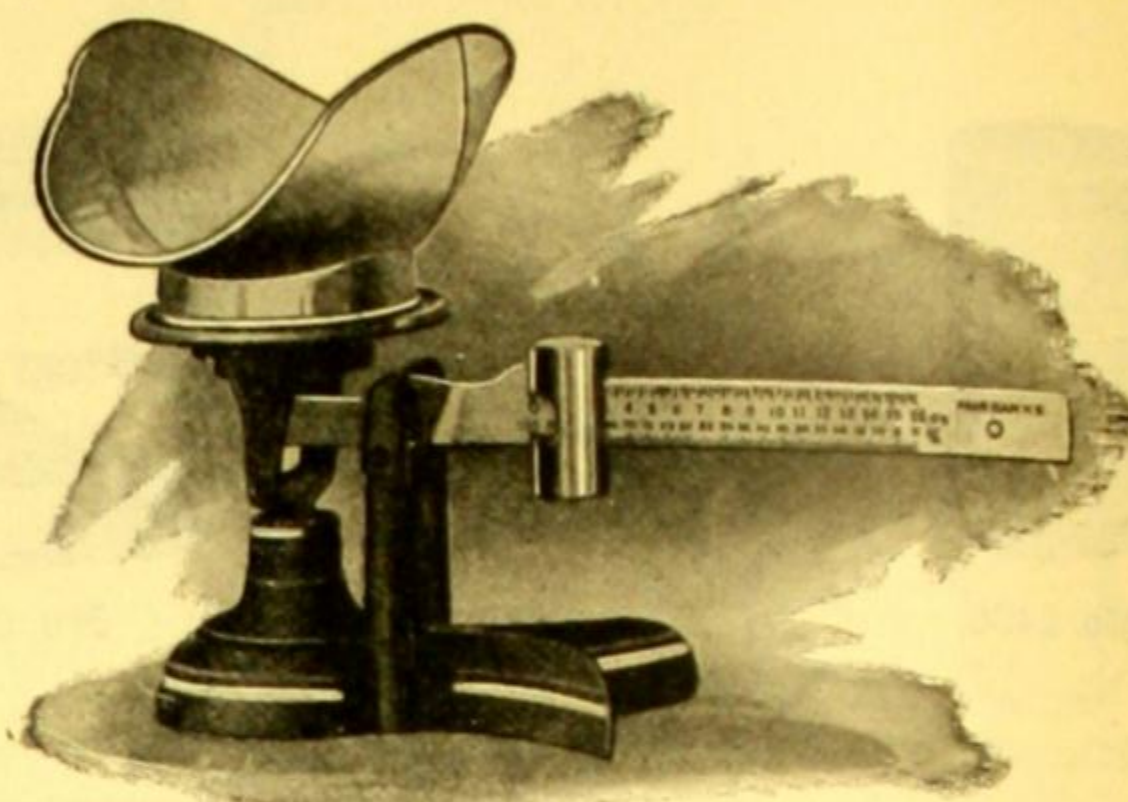
For other adhesive materials, see Glue and Wax.



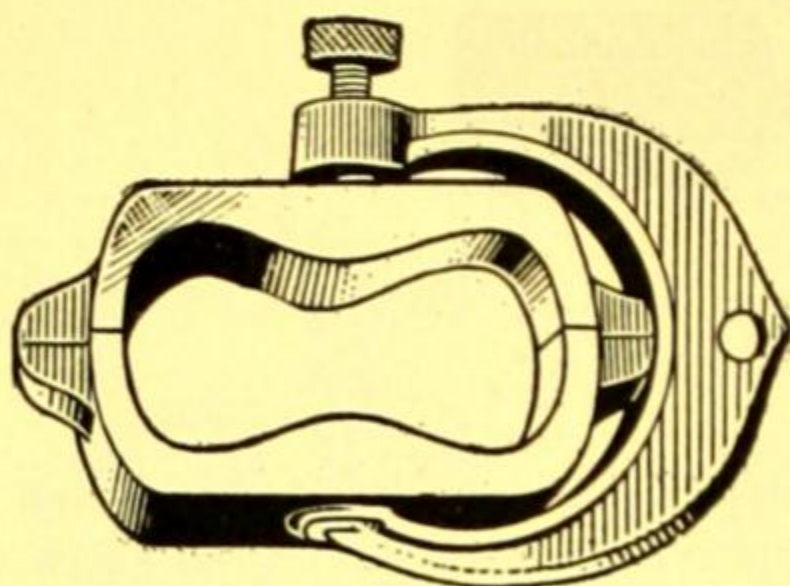
No. 2454.



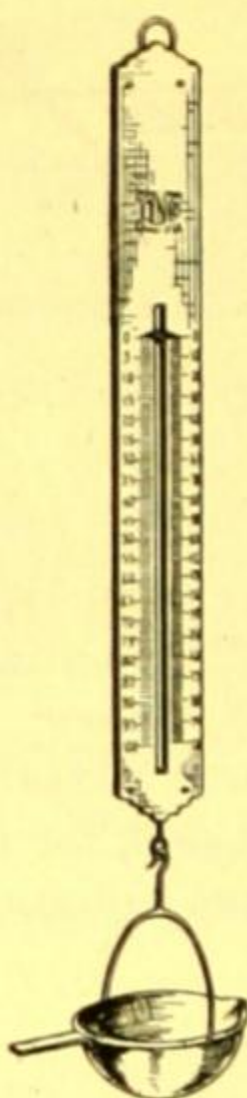
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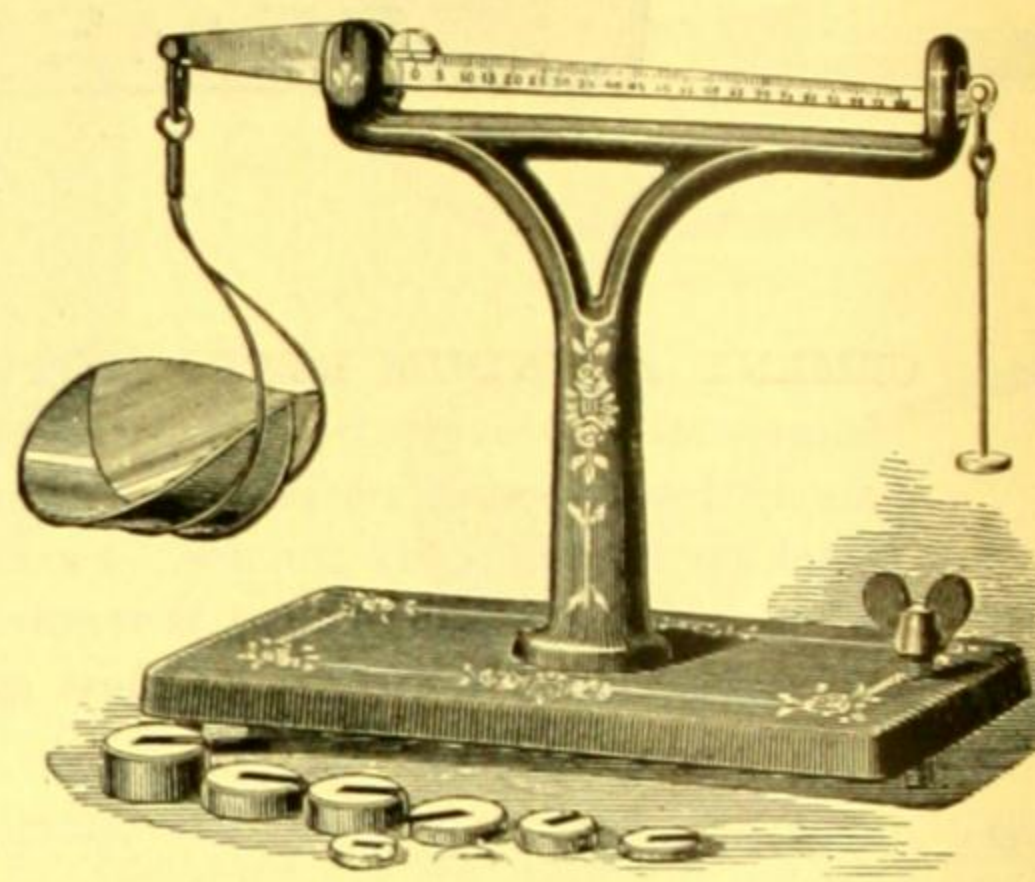
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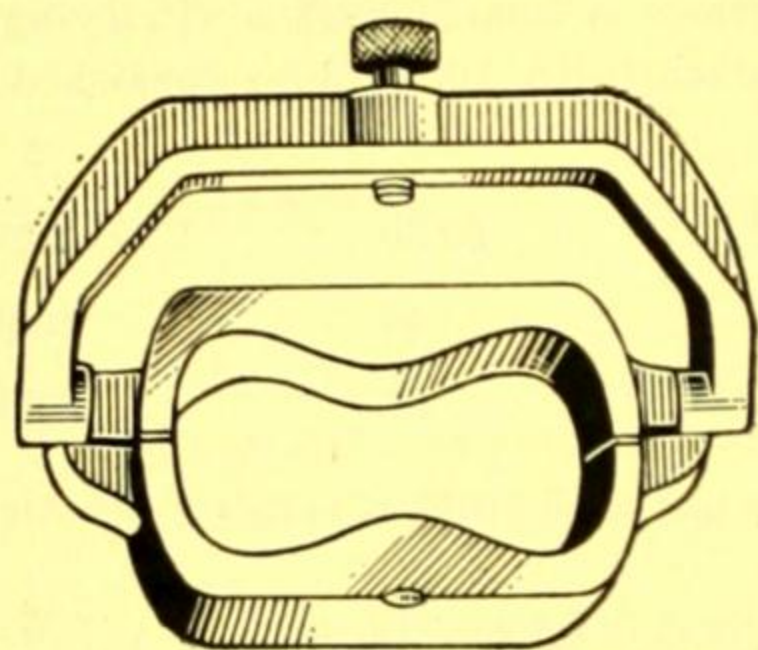
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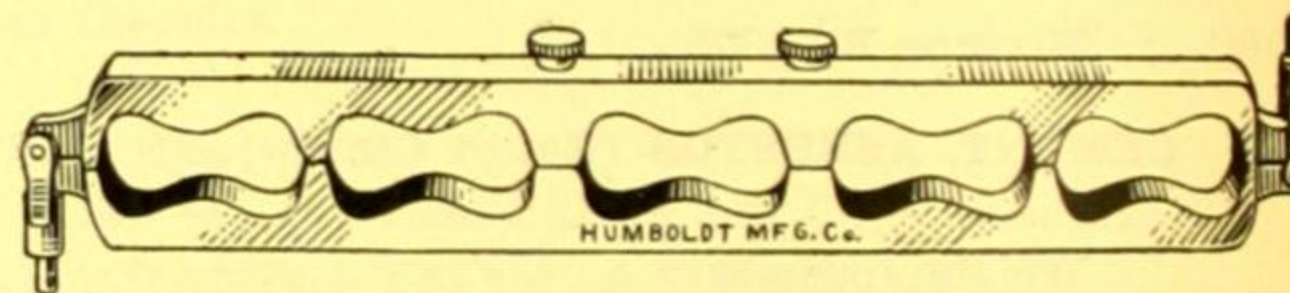
No. 645.



No. 553B.



No. 2460.

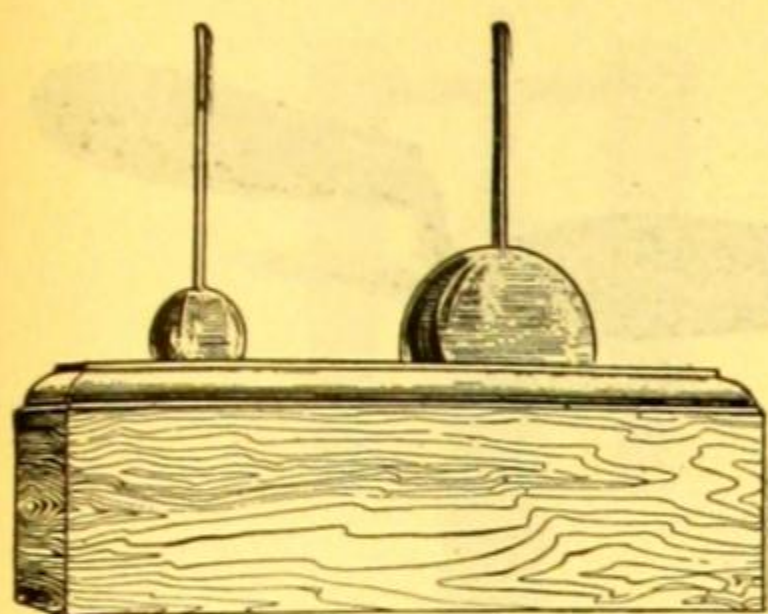


No. 2462D.

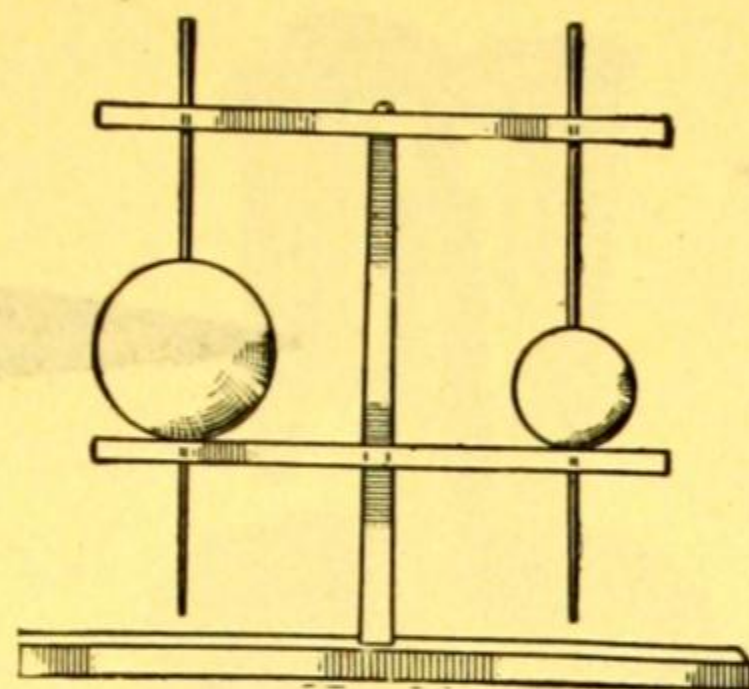
CEMENT TESTING APPARATUS

AUTOCLAVES for Cement, see general heading Autoclaves.

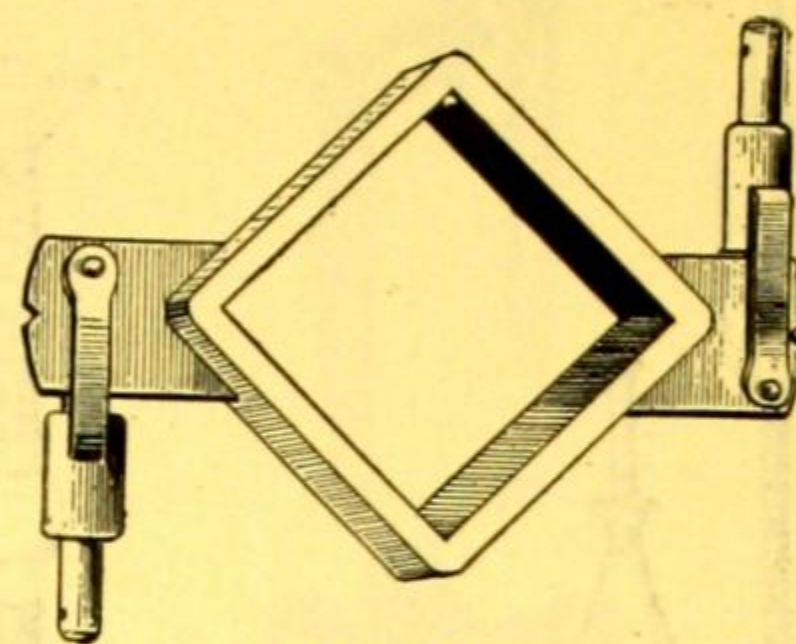
552. **BALANCE, Cement Scale**, for determining percentage of fineness of cement. Beam graduated on upper side to 16 ounces by $\frac{1}{4}$ ounce, lower side to 100% by 1%. Should be used in connection with our No. 12124 sieves. Can also be used for dirt in seed, moisture in grain, ores, etc. Complete with brass scoop..... \$12.00
- 553B. **BALANCE, Cement**, for fineness of cement, with beam graduated to weigh to 500 grams by $\frac{1}{100}$ gram divisions..... 19.00
562. **BALANCE, Decimal Scale**, for mechanical analysis of road material; capacity, 30 pounds; graduated in $\frac{1}{20}$ pound divisions. (For illustration and description see No. 562 under general heading Balances)..... 8.50
645. **BALANCE, Spring**, for mechanical analysis of road material, consisting of a straight spring balance with flat back graduated to 200 grams in one gram divisions and to 100 percent in one percent. divisions; with small aluminum pan for weighing. (See Prevost Hubbard's "Highway Instructors Handbook," page 324)..... 16.50
2454. **BRIQUETTE MOLD**, American Society for Testing Materials Type, of brass with end clamps 4.25
2456. **BRIQUETTE MOLD**, American Society for Testing Materials Type, of brass with iron horseshoe clamp..... 4.25
2460. **BRIQUETTE MOLD**, Improved Form, American Society for Testing Materials Type, for separating sections without rapping..... 4.25
2462. **BRIQUETTE GANG MOLDS**, American Society for Testing Materials Type, of brass with end and center clamps.
- | No. | A | B | C | D | E |
|---------------------------|------|-------|-------|-------|-------|
| Number of briquettes..... | 2 | 3 | 4 | 5 | 6 |
| Each..... | 8.00 | 12.00 | 16.75 | 20.00 | 25.00 |
2464. **BRUSH**, of brass wire in wood handle for cleaning briquette molds. Length of brush portion, 5 inches..... 1.00



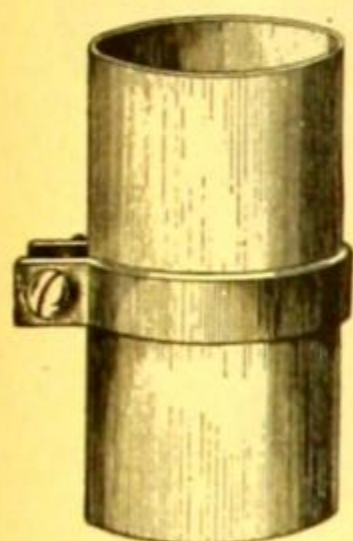
No. 2468.



No. 2470.



No. 2472.



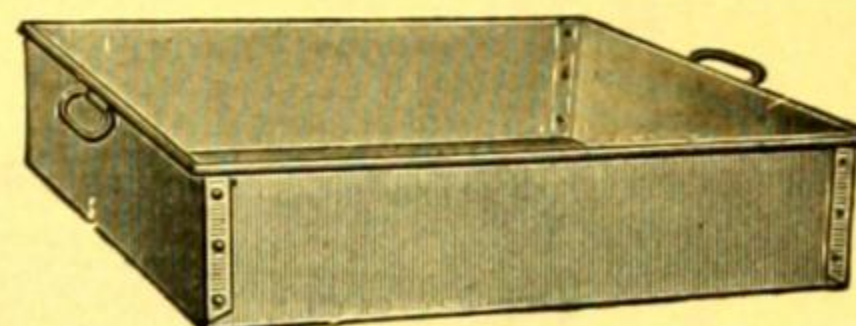
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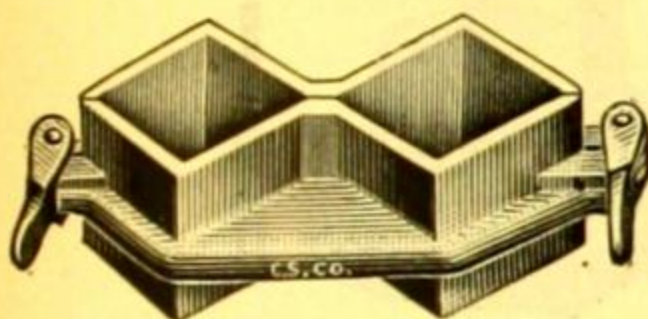
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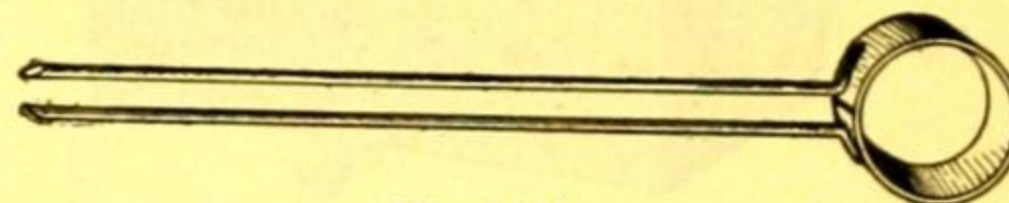
No. 2486.



No. 2488.



No. 2482.

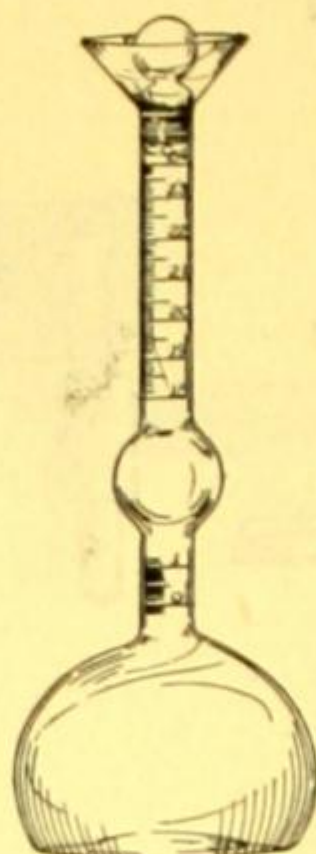


No. 2498.

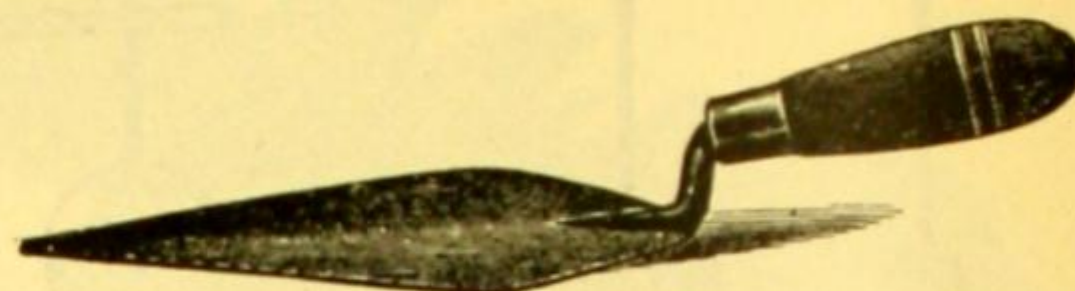
2468. **GILLMORE NEEDLES** in block, for determining both the initial and the final set of cement. They consist of a pair of steel needles, one, $\frac{1}{12}$ inch in diameter loaded with a weight of $\frac{1}{4}$ pound, and the other $\frac{1}{24}$ inch in diameter loaded with a weight of one pound..... \$7.00
2470. **GILLMORE NEEDLES**, same as No. 2468, but with vertical support to keep needles perpendicular to the surface of the pat. (Recommended by the American Society for Testing Materials in Specifications for 1921, No. C9-21.)..... 12.00
- MOIST CHAMBER for Cement**, of soapstone, furnished to order. Prices on application.
2472. **MOLDS, Cylindrical**, brass, for preparing cylinders used in determining the compressive strength of Portland cement mortars. Diameter, 2 inches; height, 4 inches. (See Tentative Standard of the American Society for Testing Materials C9—16 T)..... 3.50
2473. **TAMPER, Steel**, for use with No. 2472. Weight, about $\frac{3}{4}$ pound; length, $6\frac{5}{8}$ inches; diameter at top, $\frac{5}{8}$ inch; at bottom, 1 inch..... 3.40
2478. **MOLDS, Cube**, of brass, with hinge clamp for preparing cubes for compression tests.
- | No. | A | B |
|------------------------|------|------|
| For cubes, inches..... | 1 | 2 |
| Each | 4.25 | 5.75 |
2482. **MOLDS, Cube**, of brass, same as No. 2478, but in gangs of 2 molds.
- | No. | A | B |
|------------------------|-------|-------|
| For cubes, inches..... | 1 | 2 |
| Each | 10.00 | 13.50 |
2486. **MOLD, Pat**, for forming pats of neat cement intended for steaming tests..... 3.50
2488. **PAN**, of galvanized iron, for immersing briquettes in water before testing. Size, 24x24x3 inches..... 4.00
2490. **PLATE**, of heavy glass, for use in mixing cement and filling briquette molds. Size, 24x24x $\frac{3}{4}$ inches..... 7.50
- SAMPLE CANS for Cement**, see Boxes No. 1828.
2496. **SAND, Standard**, for cement testing, according to the American Society for Testing Materials. per 100 pound bag 6.50
- SIEVES for Cement Testing**, see No. 12124 under general heading Sieves.
2498. **SOUNDNESS TEST APPARATUS, Le Chatelier**, for indicating the soundness of cement by its expansion after being boiled..... 4.75



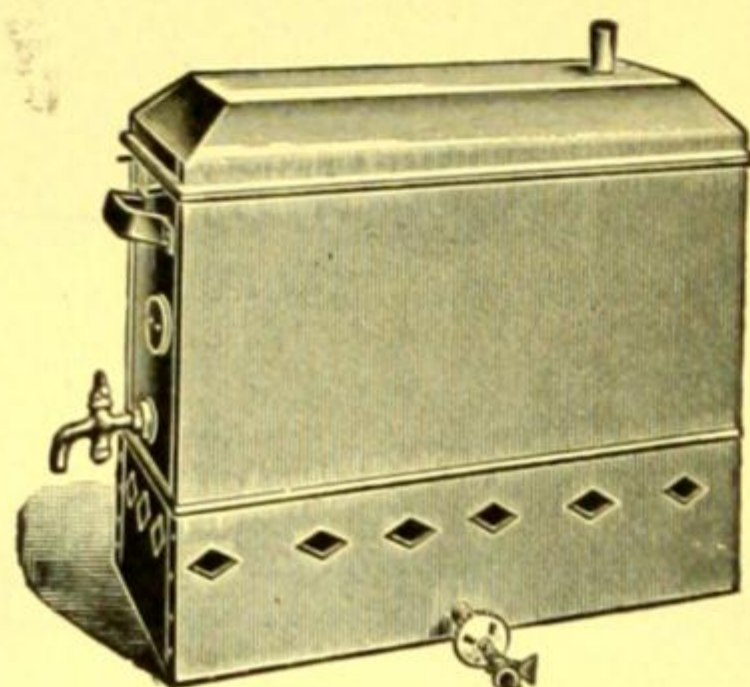
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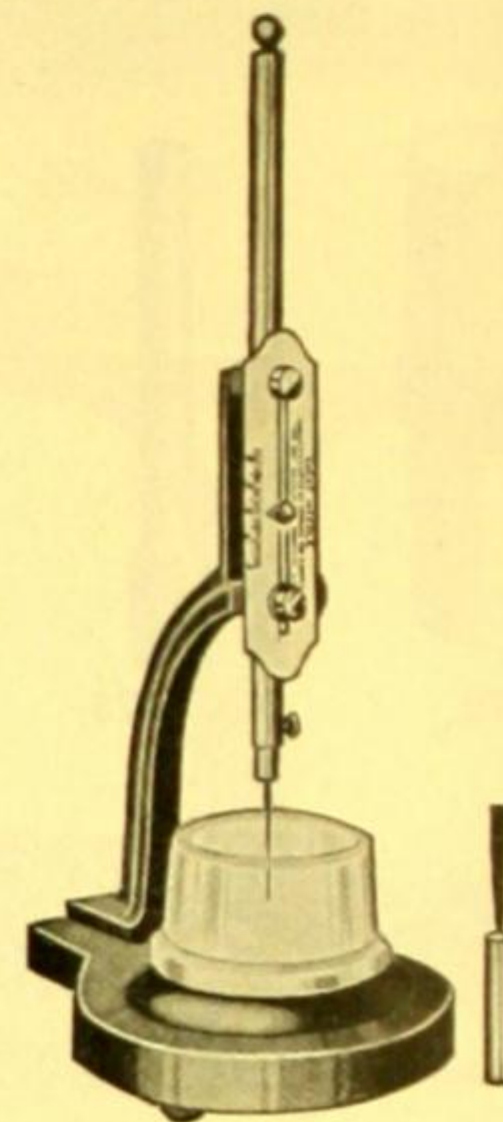
No. 1736.



No. 2512.

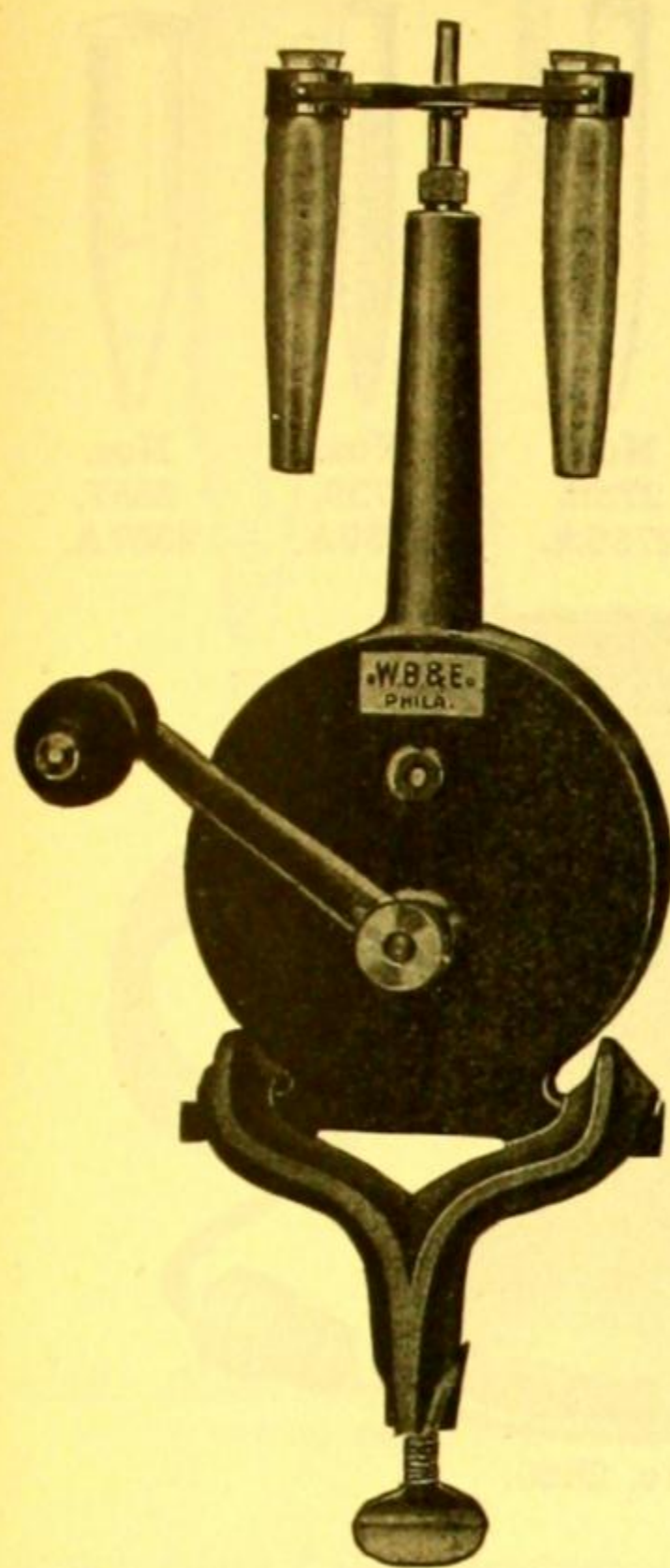


No. 2502.

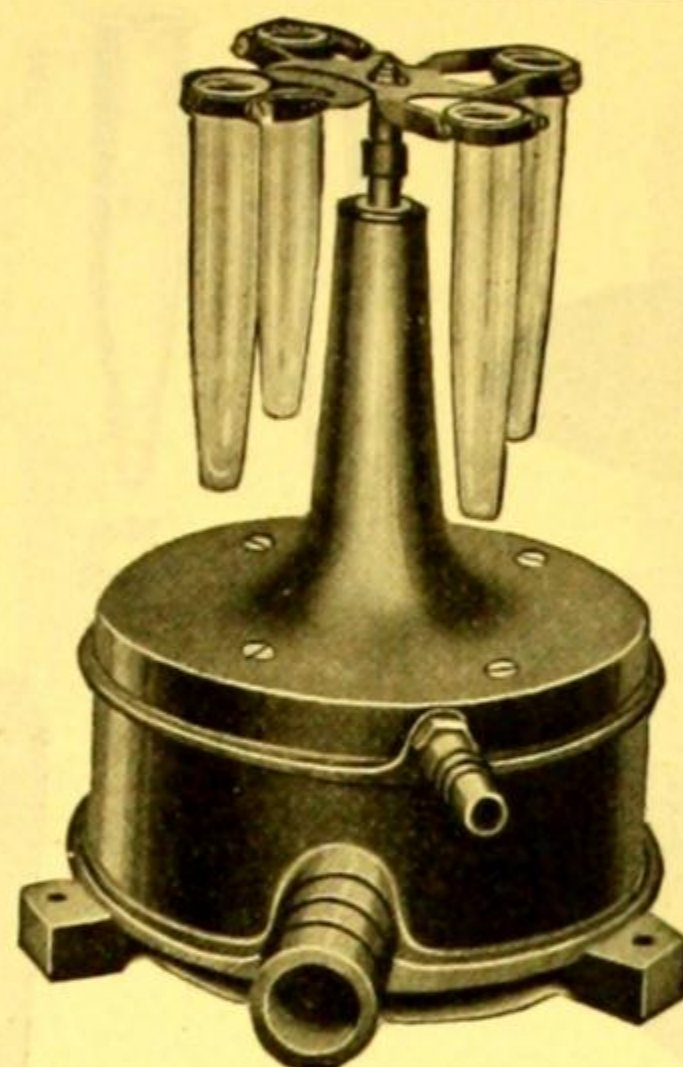


No. 2514.

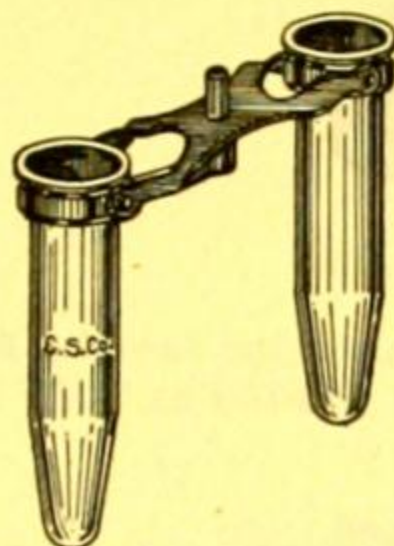
2500. **SPECIFIC GRAVITY APPARATUS, Jackson's**, for the accurate determination of the specific gravity of cement. Consists of a special burette calibrated to give specific gravity readings directly, and a special flask with ground in funnel. (See Journal of the Society of Chemical Industry, Vol. XXIII, No. 11, for June 15, 1904)..... \$8.25
1736. **BOTTLE, Specific Gravity, Le Chatelier's**, for cement, special form recommended by the United States Bureau of Standards for use in Government Specifications, and by the American Society for Testing Materials. (See Circular No. 33 of the United States Bureau of Standards, and A. S. T. M. Specifications for 1921, No. C9-21.) Without certificate..... 5.10
1737. **BOTTLE, Specific Gravity**, same as No. 1736, but standardized by the United States Bureau of Standards, with Certificate..... 9.50
2503. **STEAMING APPARATUS**, of polished copper, tinned on the inside, for boiling and steaming cement specimens for determining soundness. Mounted on sheet iron support with shelf of wire screen and gas burner. The large size is recommended as standard by the American Society for Testing Materials and the U. S. Bureau of Standards, but as this size takes up a large amount of room, we also list a smaller size of the same general type.
- | | | |
|--------------------------|----------|----------|
| No. | A | B |
| Dimensions, inches | 12x12x24 | 15x15x30 |
| Each | 45.00 | 70.00 |
1614. **CONSTANT LEVEL BOTTLE**, for use with No. 2502. Capacity, 2 gallons..... 3.50
2512. **TROWEL**, for mixing cement. Length of blade, 4 inches..... .70
2514. **VICAT NEEDLE APPARATUS, Bramwell Improved Form**, for determining the normal consistency and setting time of cement according to the methods recommended by the American Society for Testing Materials. The needles are on opposite ends of the 300 gram plunger rod, the change being made by reversing the rod. Diameter of large needle, 1 cm; diameter of small removable needle, 1 mm. (See Standard Specifications of the A. S. T. M. for 1921, C9-21.) 27.50
2515. **Rubber Mold** only for No. 2514..... 3.50



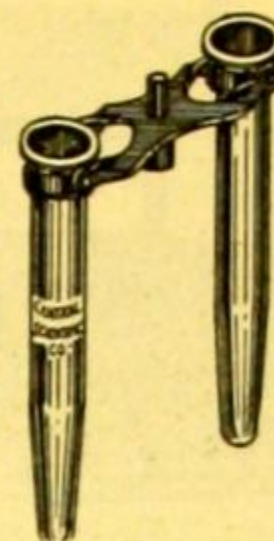
No. 2524.



No. 2534.



No. 2539.



No. 2537.



No. 2538.

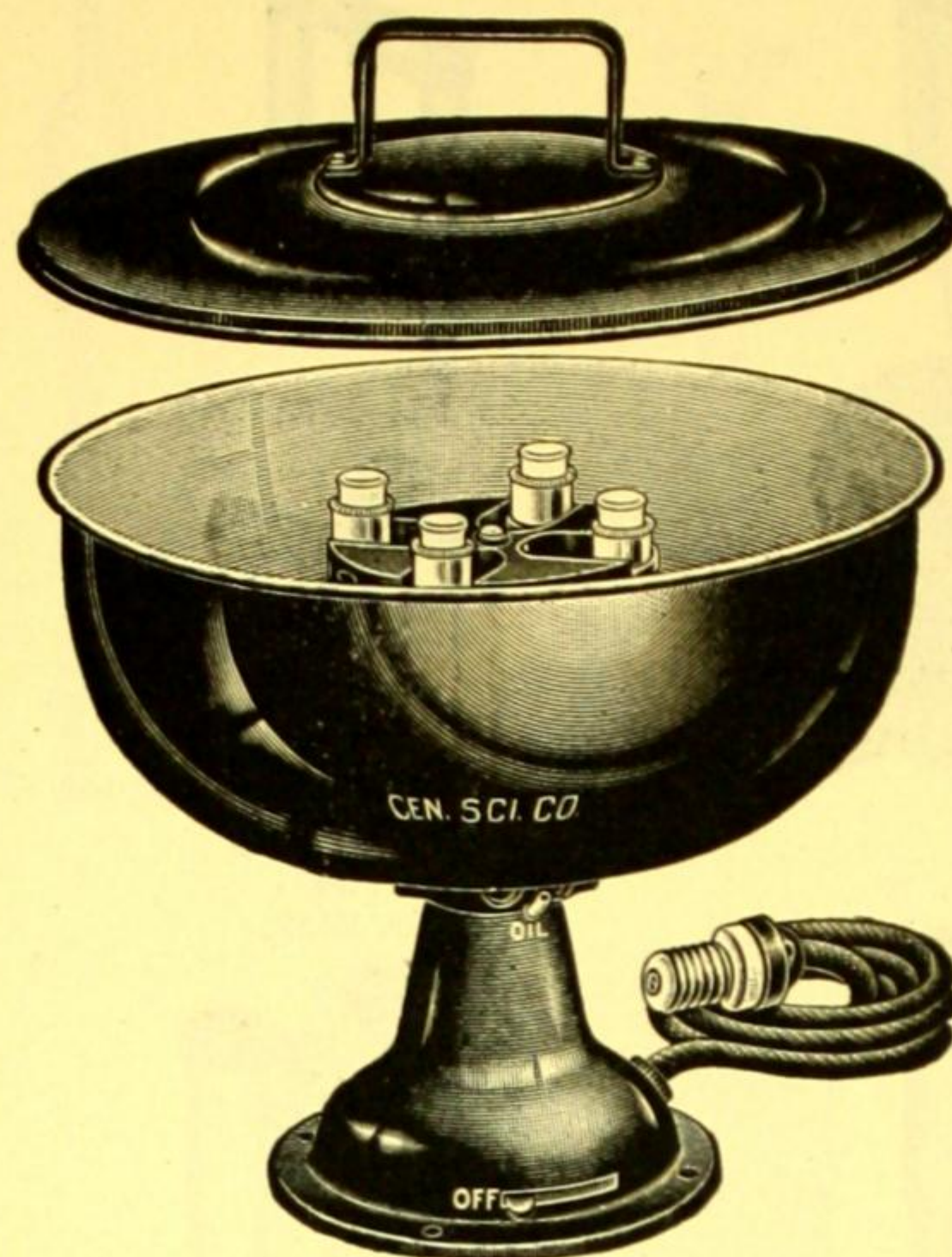


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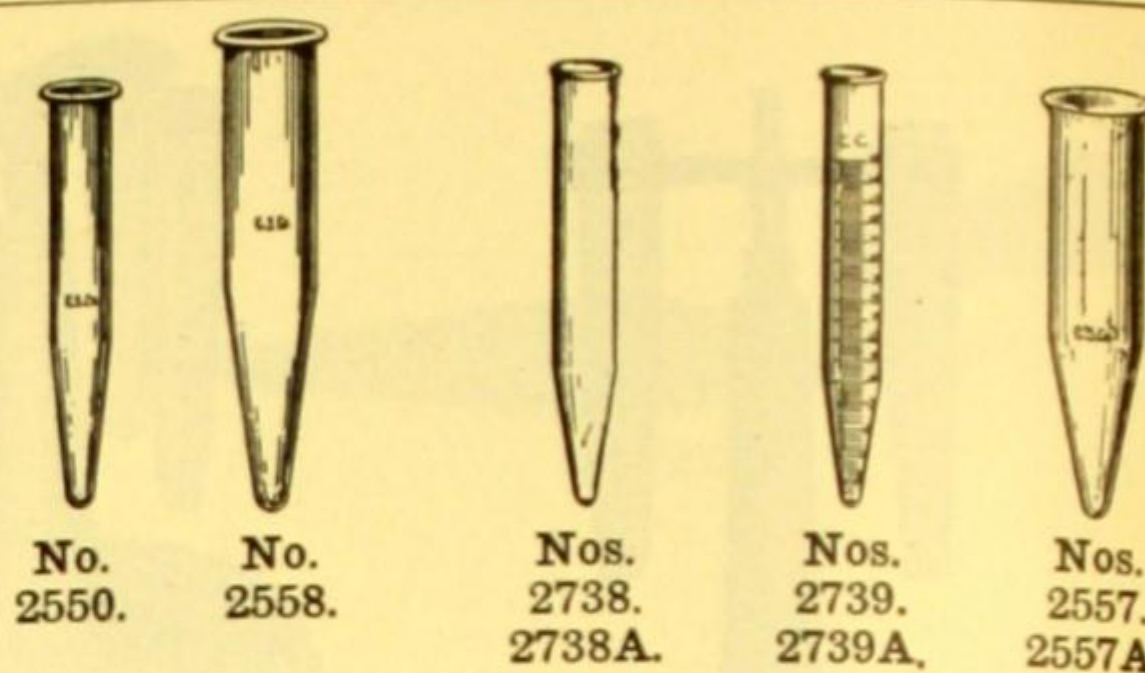
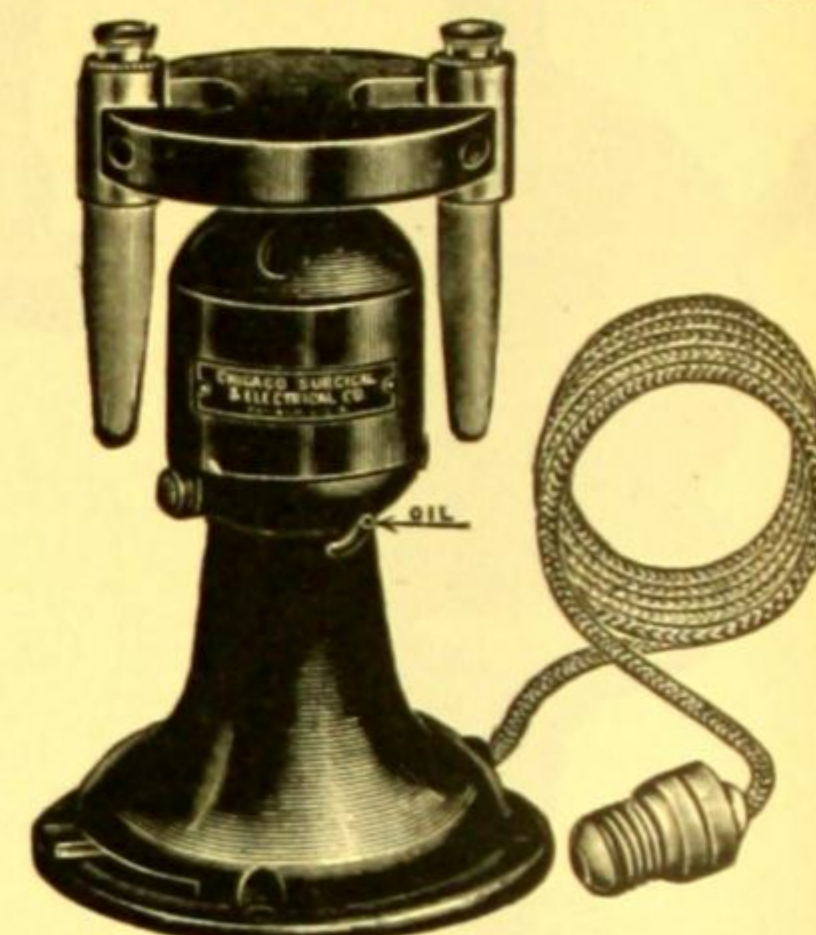
CENTRIFUGES

2524. **CENTRIFUGE, Hand Driven**, for two 15 cc tubes. This machine will whirl two 15 cc tubes filled with liquid at 1200 revolutions per minute when the handle is turned at the rate of one revolution per second. The strong iron horseshoe clamp with thumb-screw permits rigid fastening of the centrifuge to the edge of a table so that the machine operates without vibration. Complete with two-tube head, two aluminum shields and one each graduated and ungraduated 15 cc glass tubes. \$10.75
2534. **CENTRIFUGE, Water Motor**, for four 15 cc tubes. For attachment to a smooth faucet. Speed is controlled by the flow of water, which, with the head for four 15 cc tubes, will range from 850 r. p. m. with 15 pounds water pressure to 1700 r. p. m. with 60 pounds pressure. Each machine is so constructed that bearings cannot become rusted nor can oil be washed out. Complete with three feet of pressure tubing, hose connection for attachment to smooth faucet, one four-tube head, four aluminum shields and two each graduated and ungraduated 15 cc glass tubes. 21.00
2537. **Two-Tube Head**, only, for 15 cc tubes. For use on Nos. 2524 and 2534 Centrifuges. Without shields or glass tubes. 3.00
2538. **Four-Tube Head**, only, for 15 cc tubes. For use on Nos. 2524 and 2534 Centrifuges. Without shields or glass tubes. 5.00
2539. **Two-Tube Head**, only, for 50 cc tubes. For use on Nos. 2524 and 2534 Centrifuges. Without shields or glass tubes. 6.50
2540. **Four-Tube Head**, only, for 50 cc tubes. For use on Nos. 2524 and 2534 Centrifuges. Without shields or glass tubes. 8.50
- For Shields and Glass Tubes for Nos. 2524 to 2540, see **Accessories for Centrifuges Nos. 2524 to 2563.**

CENTRIFUGES, Electric, desk size, for 15 cc tubes only. A small compact centrifuge mounted on a heavy iron pedestal, which contains a three-point speed-control switch and cut-off. A maximum speed of 1800 revolutions per minute with the two tube head and 1400 revolutions per minute with the four tube head can be attained. To insure stability, the tube carrier or head is made into a heavy balance wheel, equipped on the underside with four fan blades to create a steady current of air through the windings of the motor to prevent overheating on long runs. The arrangement of the blades is such that liquids cannot be accidentally spilled into the motor. The tube carriers or heads, supplied with these centrifuges, are completely equipped with trunnion rings, tube shields and glassware. If it is not intended to use the centrifuge in a cabinet, we recommend the purchase of Nos. 2562 or 2563 Centrifuges with the Protecting Dome to avoid the possibility of a serious accident. Dimensions without dome,



No. 2563.

No.
2550.No.
2558.Nos.
2738.
2738A.Nos.
2739.
2739A.Nos.
2557.
2557A.

No. 2560.

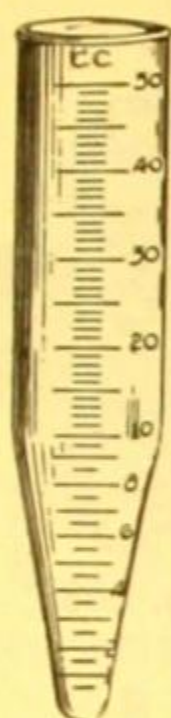
CENTRIFUGES, Electric, desk size, continued.

9½ inches total height, 11½ inches rotating diameter. Maximum current consumption ¾ ampere. No special wiring is required for these centrifuges as they may be connected into the regular lighting sockets without danger. Complete as described with attachment cord and plug.

No.	A	B	C	D	
	A. C.			D. C.	
	For volts	110	220	110	220
2560.	With two-tube head	\$38.00	43.00	38.00	43.00
2561.	With four-tube head	42.00	47.00	42.00	47.00
2562.	With two-tube head and protecting dome	50.50	55.50	50.50	55.50
2563.	With four-tube head and protecting dome	54.50	59.50	54.50	59.50
2564.	Protective Dome, for Nos. 2560 and 2561 Centrifuges, made of heavy spun copper, with closely fitting lid with handle, finished inside and out in black enamel. Can be easily attached. The use of this dome permits a higher speed and eliminates danger to the operator. Diameter, 12½ inches; depth, 5 inches.				
					12.50

Accessories for Centrifuges Nos. 2524 to 2563.

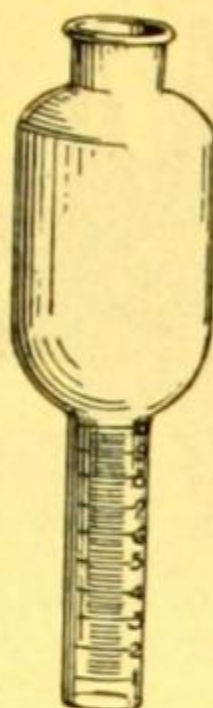
2550.	Shield, Aluminum, for 15 cc tubes. For use on Centrifuges Nos. 2524 to 2563.	.20
2558.	Shield, Aluminum, for 50 cc tubes. For use on Centrifuges Nos. 2524 and 2534, when equipped with Heads Nos. 2539 and 2540.	.35
2738.	Glass Tubes, Plain, 15 cc, with conical bottoms. For use on Centrifuges Nos. 2524 to 2563.	each, .12 per dozen, 1.20 per gross, 12.00
2738A.	Glass Tubes, Plain, 15 cc, same as No. 2738 but of Pyrex glass.	each, .28 per dozen, 3.00 per gross, 30.25
2739.	Glass Tubes, Graduated, 15 cc, with conical bottoms graduated in 1/10 cc divisions to 10 cc and in 1 cc divisions to 15 cc. For use on Centrifuges Nos. 2524 to 2563.	each, .45 per dozen, 4.80 per gross, 49.00
2739A.	Glass Tubes, Graduated, 15 cc, same as No. 2739 but of Pyrex glass.	each, 1.00 per dozen, 10.80 per gross, 108.00
2557.	Glass Tubes, Plain, 50 cc, with conical bottoms. For use on Centrifuges Nos. 2524 and 2534, when equipped with Heads Nos. 2539 and 2540.	each, .25 per dozen, 2.17 per gross, 27.00
2557A.	Glass Tubes, Plain, 50 cc, same as No. 2557 but of Pyrex glass.	each, .50 per dozen, 5.40 per gross, 57.60



No. 2556.



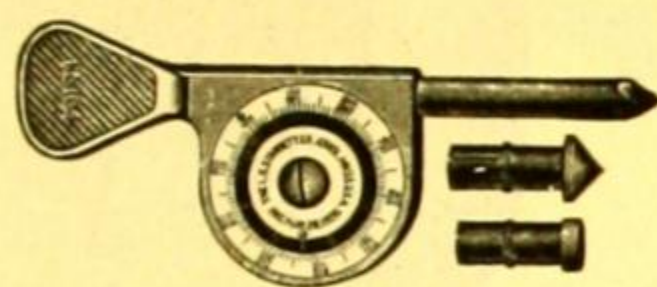
No. 2743.



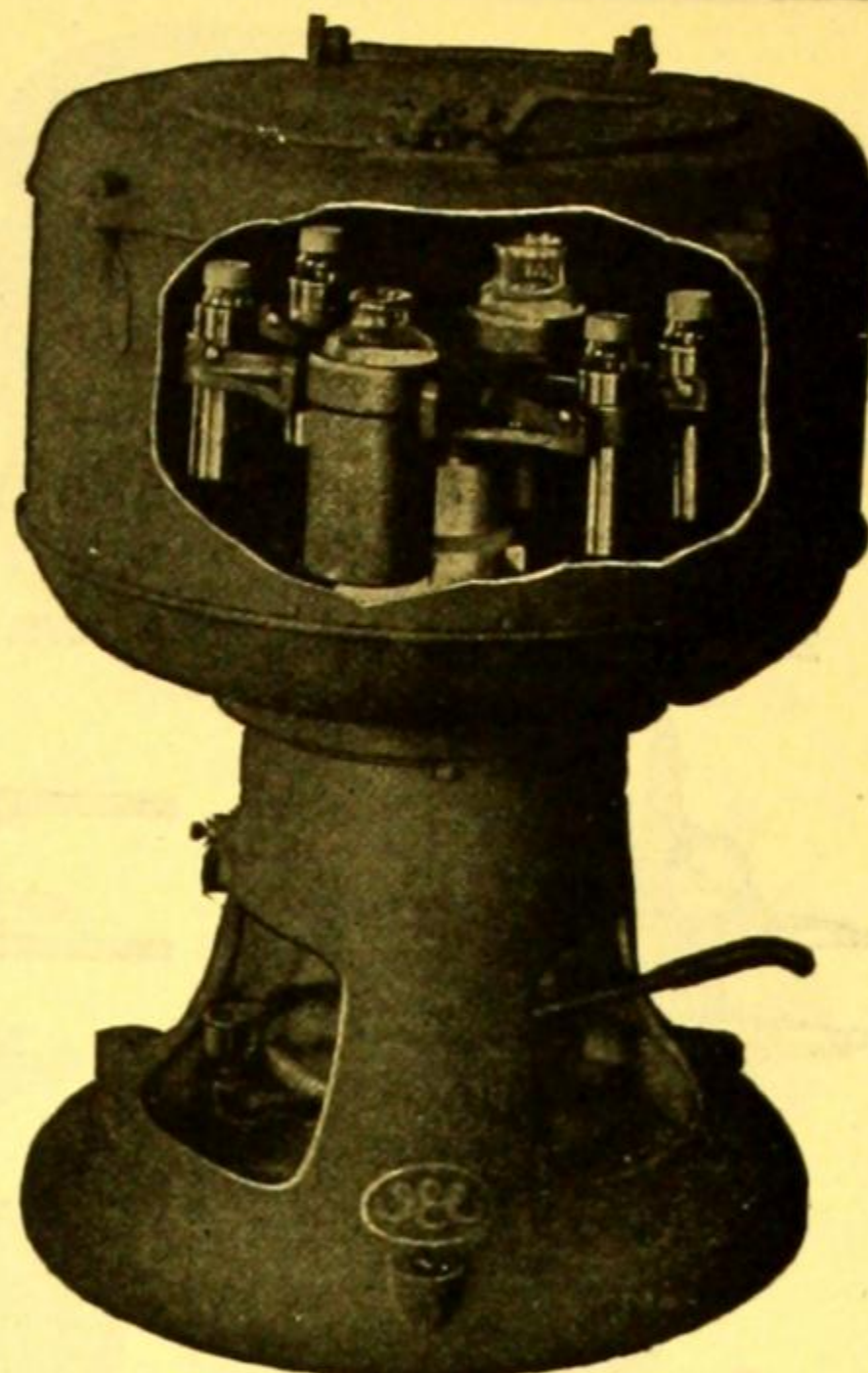
No. 9170.



No. 2742.



No. 12698.

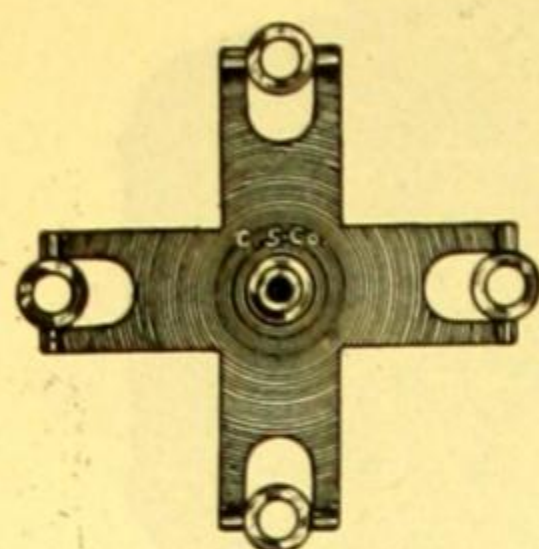


Nos. 2670-2676.

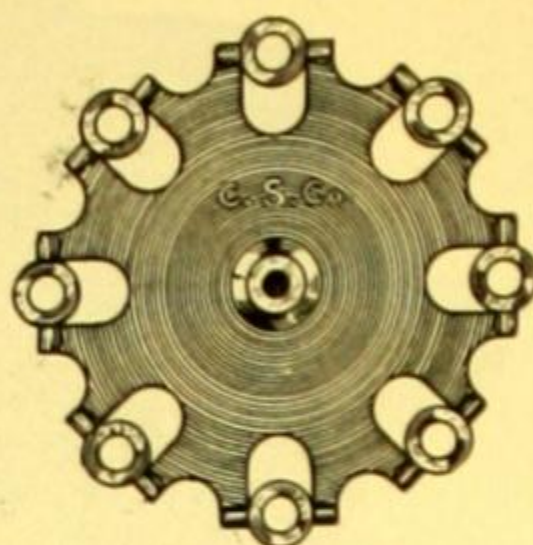
2556. **Glass Tubes, Graduated, 50 cc, with conical bottoms.** For use on Centrifuges Nos. 2524 and 2534, when equipped with Heads Nos. 2539 and 2540 each, \$.60
per dozen, 6.50
per gross, 69.00
- 2556A. **Glass Tubes, Graduated, 50 cc, same as No. 2556 but of Pyrex glass.**..... each, 1.50
per dozen, 16.20
2743. **Babcock Tube, Human Milk, with stem graduated in per cent. of fat, each division representing 0.2 per cent. fat.** For use in shield for 15 cc tubes45
9170. **Casein Tube, Hart's, for estimating the amount of casein in milk, 50 cc capacity with stem graduated to 0.2 per cent. casein.** For use in shield for 50 cc tubes..... .40
2742. **Vaccine Tube, Hopkins, for vaccine standardization. To contain 10 cc vaccine, stem graduated in 0.05 cc by 0.01 cc.** For use in shields for 15 cc tubes..... .60
12698. **Speed Indicator, improved form, may be run at highest speed required without heating.** The rotating disk, being carried by friction, may be easily moved to the starting point where the raised knobs coincide. Pressing the raised knob on the rotating disk with the thumb prevents the disk from moving until the hand of the watch gets to the right position to take the time. Every hundred revolutions may be noted by feeling the knob pass under the thumb, thus relieving the eye which has only to look on the watch to note the time. Nickel-plated.... 1.50

INTERNATIONAL ELECTRIC CENTRIFUGES

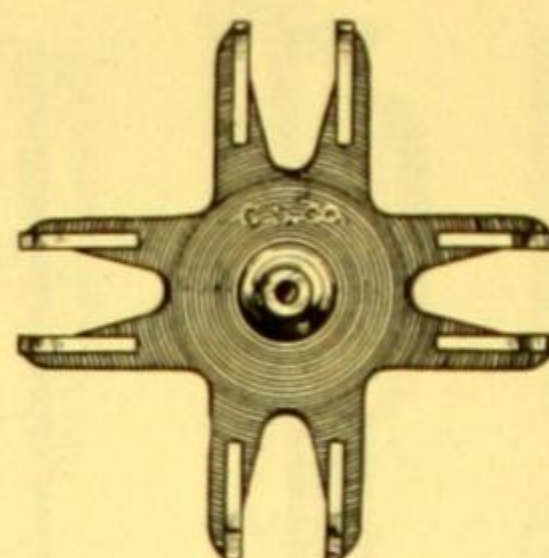
2670. **CENTRIFUGE, International No. 1, Type SB.** An improved model of the compact, high power centrifuges, which have proven so satisfactory in the past for both routine and research work in bacteriological, physiological and chemical laboratories. This machine has an overall diameter of 20 inches, is 24 inches high with the lid closed, 27 inches with the lid open and weighs about 300 pounds packed for shipment. The main improvement is in the motor, which is flexibly mounted to allow self balancing in case of slightly unbalanced loads. The lower end of the shaft of the motor runs on a ball step immersed in oil. The speed of the motor is controlled by a separate rheostat designed to mount on the wall. The limit of speed varies with different heads and tubes. The maximum centrifugal force with small loads is approximately 2500 times gravity and with large loads 900 times gravity. A combination brake and brush release operated by a lever at the lower end of the motor shaft permits the operator to stop the machine quickly or if desired to relieve the brush tension to allow the machine to come to rest as slowly as possible, thus preventing the stirring up of fine precipitates. The enclosing case, made of cast iron and rolled steel, is designed so that it may be easily washed out and the liquid removed through a convenient drain. A removable top is provided for the enclosing case, which, with the drainage in the bottom, adapts it for use as a basket centrifugal. Complete with rheostat but **without head or tubes**, with motor for 110 volts, 60 cycles, A. C. 166.50
2672. **CENTRIFUGE, International No. 1, Type SB, same as No. 2670, but for 220 volts, 60 cycles, A. C.** 166.50
2674. **CENTRIFUGE, International No. 1, Type SB, same as No. 2670, but for 110 volts D. C.** 166.50
2676. **CENTRIFUGE, International No. 1, Type SB, same as No. 2670, but for 220 volts D. C.** 166.50



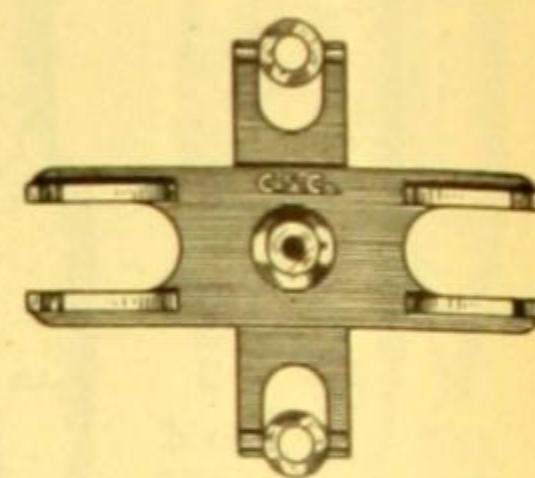
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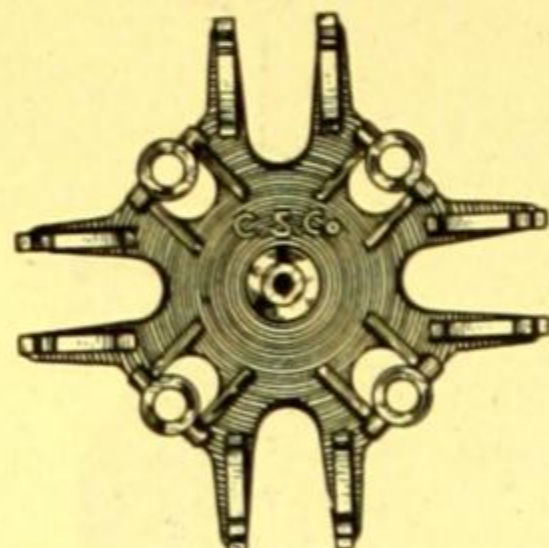
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No. 2681.



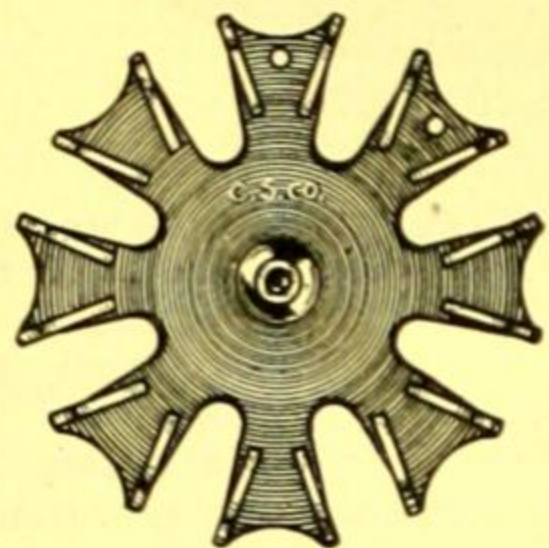
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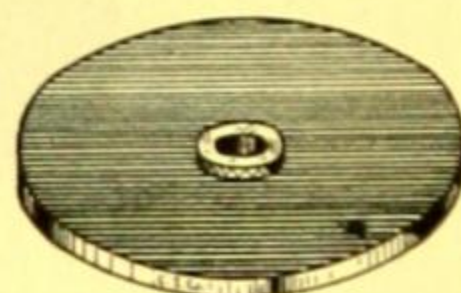
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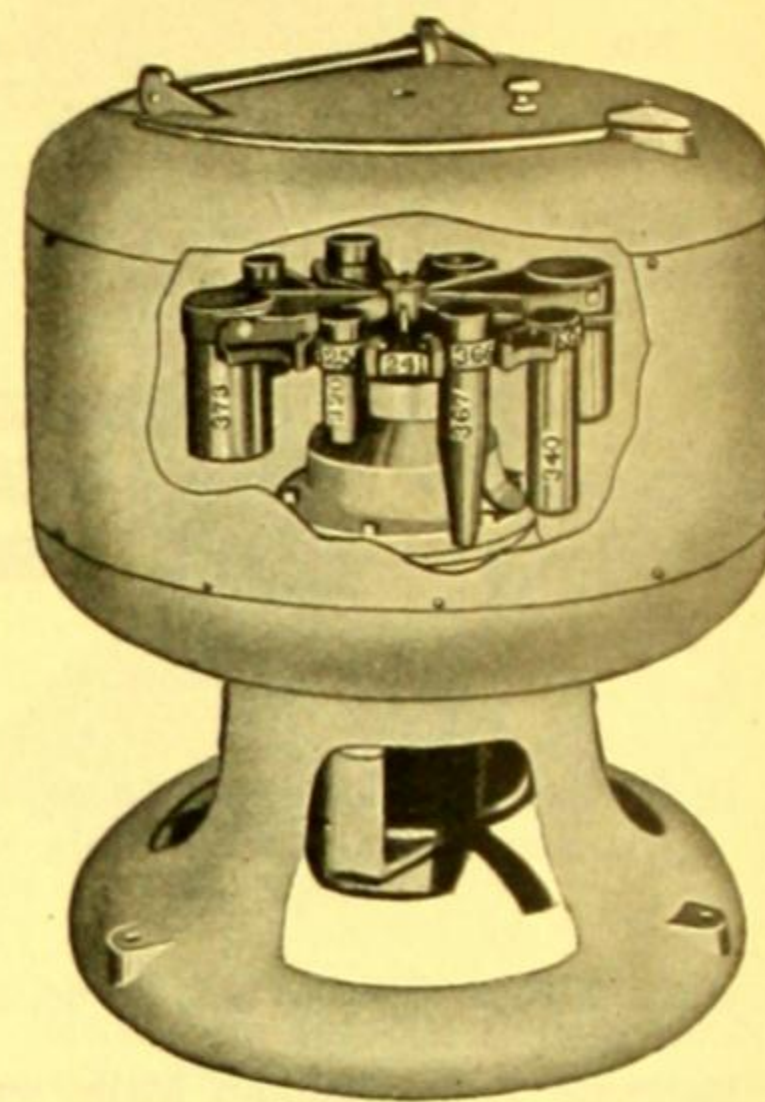
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No. 2685.



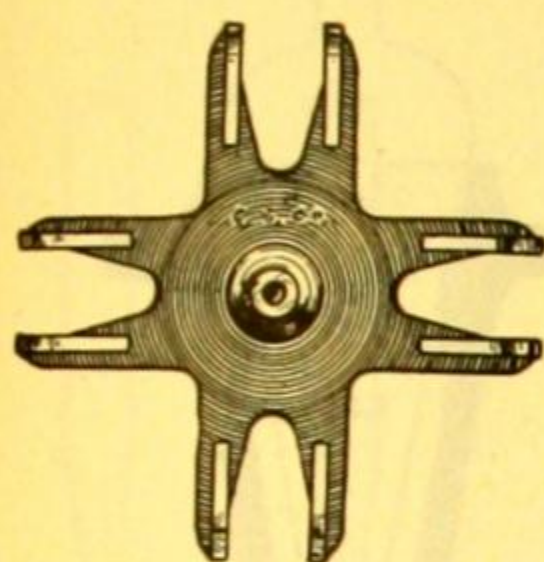
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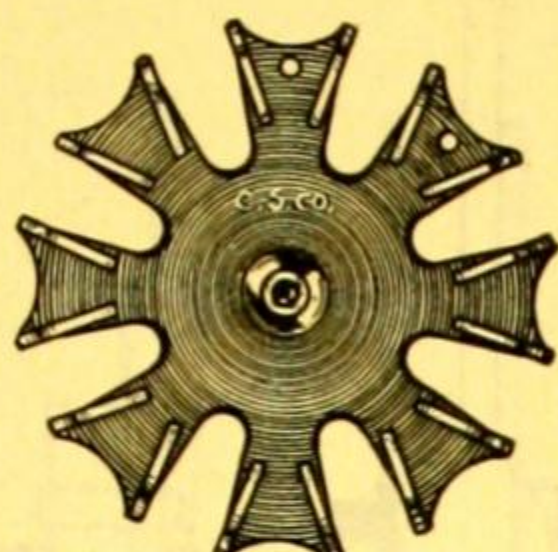
Nos. 2696-2702.

Heads for International Centrifuge, Size No. 1.

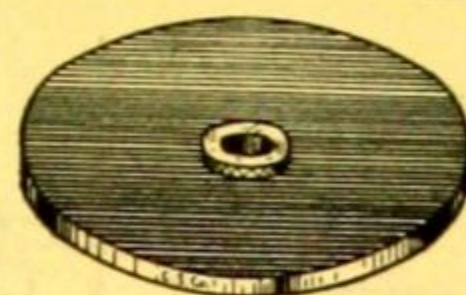
2678. Head, Four-Place, for 15 cc tubes, with attached trunnion rings for No. 2728 metal shields. \$ 9.00
2679. Head, Eight-Place, for 15 cc tubes, with attached trunnion rings for No. 2728 metal shields. 15.50
2681. Head, Four-Place, for 50 cc trunnion rings No. 2732. Will also carry trunnion cups Nos. 2733 and 2735. 9.00
2682. Head, Four-Place Combination, with attached trunnion rings for two 15 cc metal shields No. 2728 and places for two 50 cc trunnion rings No. 2732. Will also carry two trunnion cups Nos. 2733 and 2735. 9.00
2683. Head, Eight-Place Combination, with attached trunnion rings for four 15 cc metal shields No. 2728 and places for four 50 cc trunnion rings No. 2732. Will also carry four trunnion cups Nos. 2733 and 2735. 16.20
2684. Head, Two-Place, for carrying trunnion carriers Nos. 2736, 2737 and 2759 for Squibb separatory funnels, Goetz tubes and 250 cc bottles. 4.50
2685. Head, Eight-Place, for 50 cc trunnion rings No. 2732. Will also carry trunnion cups Nos. 2733 and 2735. 14.40
2686. Disk, Board of Health for Milk Sediment, to carry twenty 2 cc tubes No. 2750. Without tubes. 15.75
- For Trunnion Rings, Carriers, Cups and Metal Shields, see Fittings for International Centrifuge Heads.
2696. CENTRIFUGE, International No. 2, similar in construction to No. 2670, but larger, affording greater capacity and rendering available more varied equipment. The machine has an overall diameter of 24 inches, is 28 inches high with the lid closed, 40 inches with the lid open and weighs about 450 pounds packed for shipment. A hand brake and device for releasing the brush tension is provided, as is a separate speed-control rheostat for mounting on the wall. The limit of speed varies with the different heads and tubes. A centrifugal force of 2050 times gravity can be attained with a four-place head fitted with 50 cc tubes, other loads vary proportionally. Complete with rheostat but without head or tubes, with motor for 110 volts, 60 cycles A. C. 230.00
2698. CENTRIFUGE, International No. 2, same as No. 2696, but for 220 volt, 60 cycles A. C. 230.00
2700. CENTRIFUGE, International No. 2, same as No. 2696, but for 110 volts D. C. 230.00
2702. CENTRIFUGE, International No. 2, same as No. 2696, but for 220 volts D. C. 230.00



No. 2681.



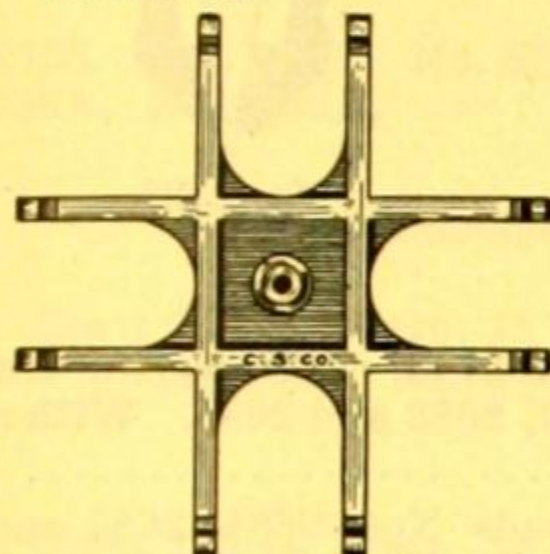
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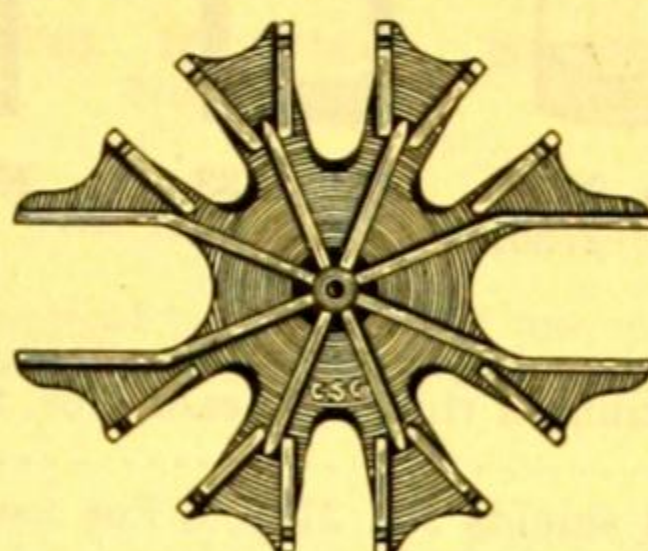
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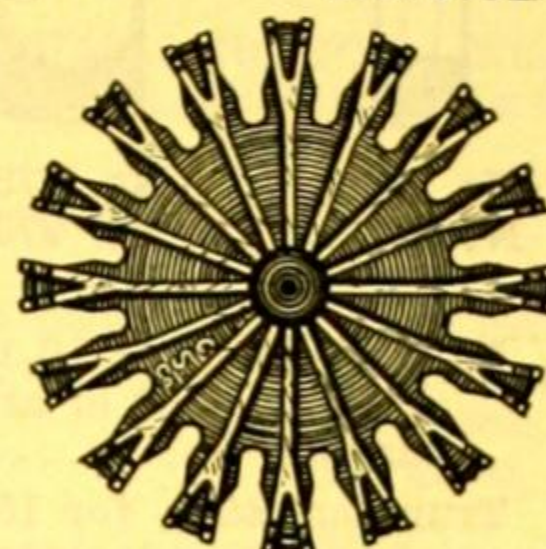
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No. 2705.



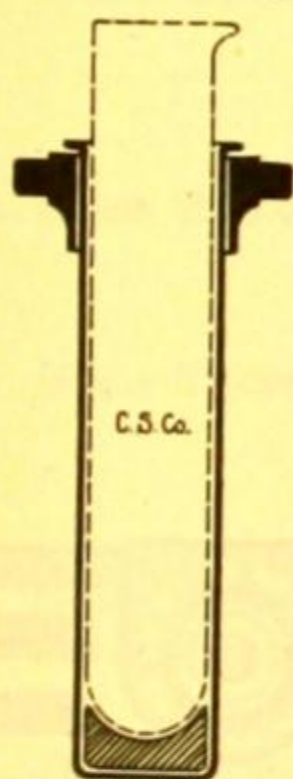
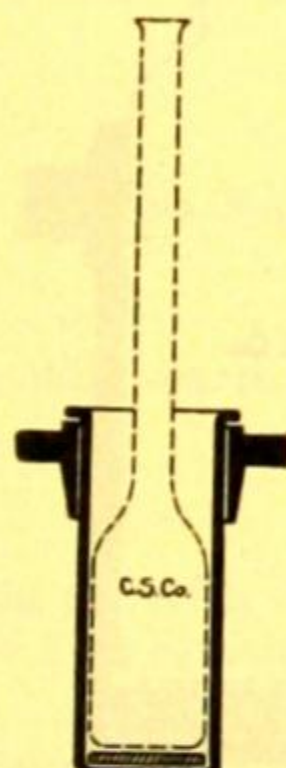
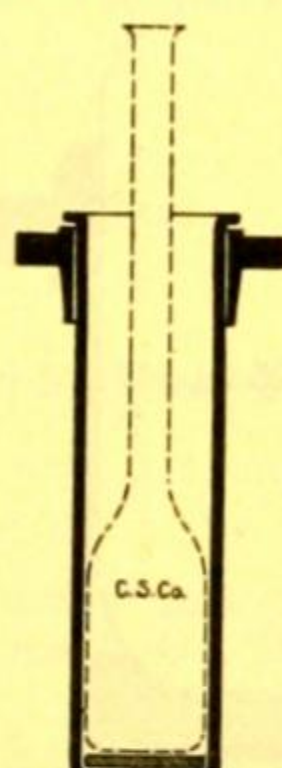
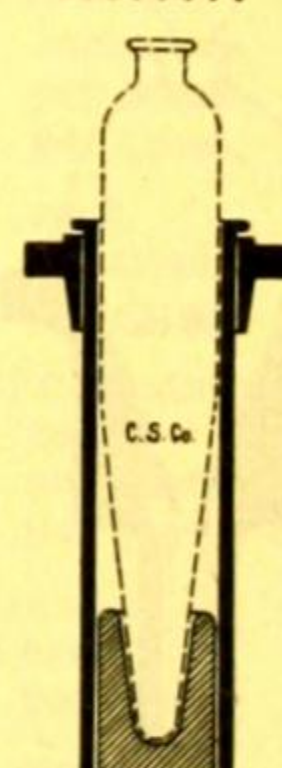
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No. 2708.

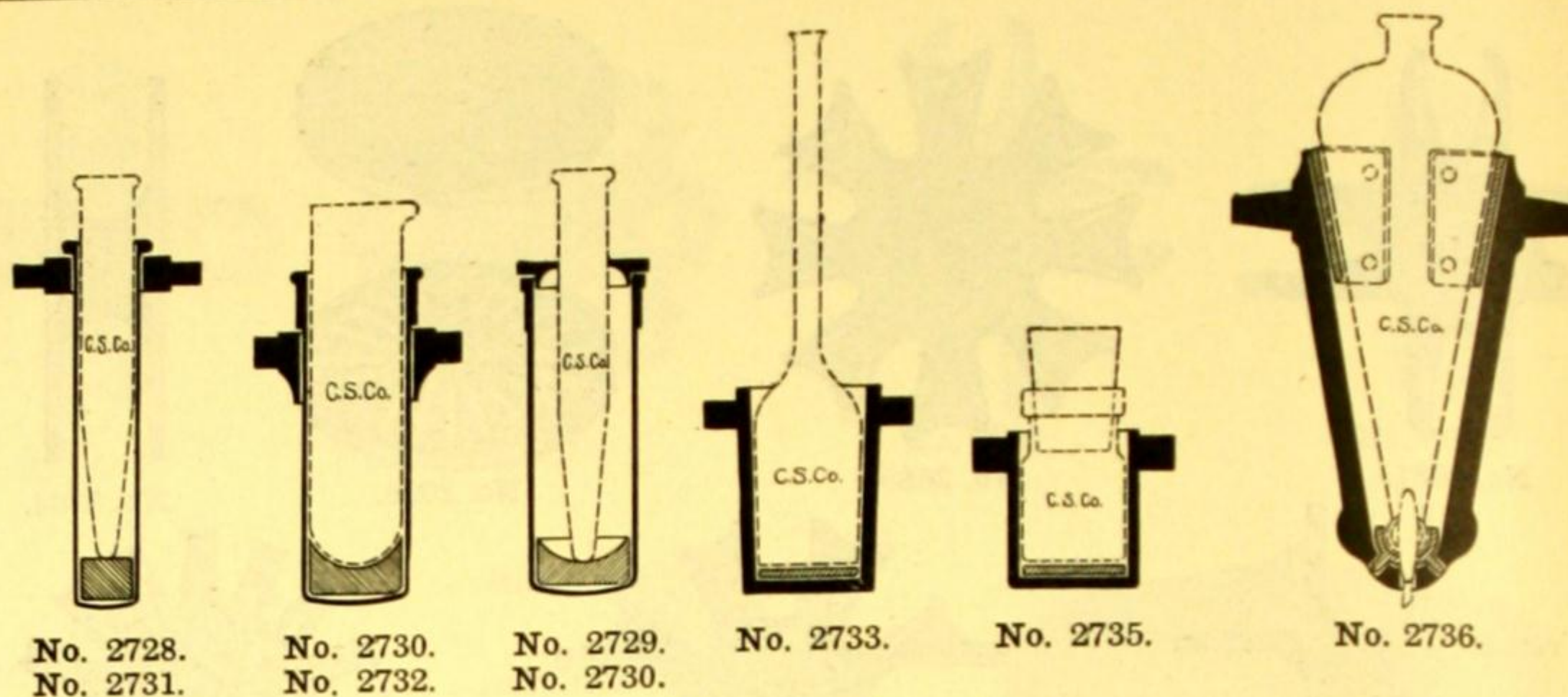
Heads for International Centrifuge, Size No. 2.

2681. Head, Four-Place, for 50 cc trunnion rings No. 2732. Will also carry trunnion rings Nos. 2711, 2715, 2731, and cups Nos. 2733 and 2735. \$ 9.00
2685. Head, Eight-Place, for 50 cc trunnion rings No. 2732. Will also carry trunnion rings Nos. 2711, 2715, 2731, and cups Nos. 2733 and 2735. 14.40
2686. Disk, Board of Health for Milk Sediment, to carry twenty 2 cc tubes No. 2750. Without tubes 15.75
2704. Head, Two-Place, for carrying trunnion carriers Nos. 2736, 2737 and 2759 for Squibb separatory funnels, Goetz tubes and 250 cc bottles. 7.75
2705. Head, Four-Place, for carrying trunnion carriers Nos. 2736, 2737 and 2759 for Squibb separatory funnels, Goetz tubes and 250 cc bottles. 12.35
2706. Head, Eight-Place Combination, for six 50 cc trunnion rings No. 2732 and two trunnion carriers Nos. 2736, 2737 and 2759 for Squibb separatory funnels, Goetz tubes or 250 cc bottles. Will also carry trunnion rings Nos. 2711, 2715, 2731, and cups Nos. 2733 and 2735. 18.45
2708. Head, Sixteen-Place, for 50 cc trunnion rings No. 2732. Will also carry trunnion rings No. 2715 and cups Nos. 2733 and 2735. 24.50

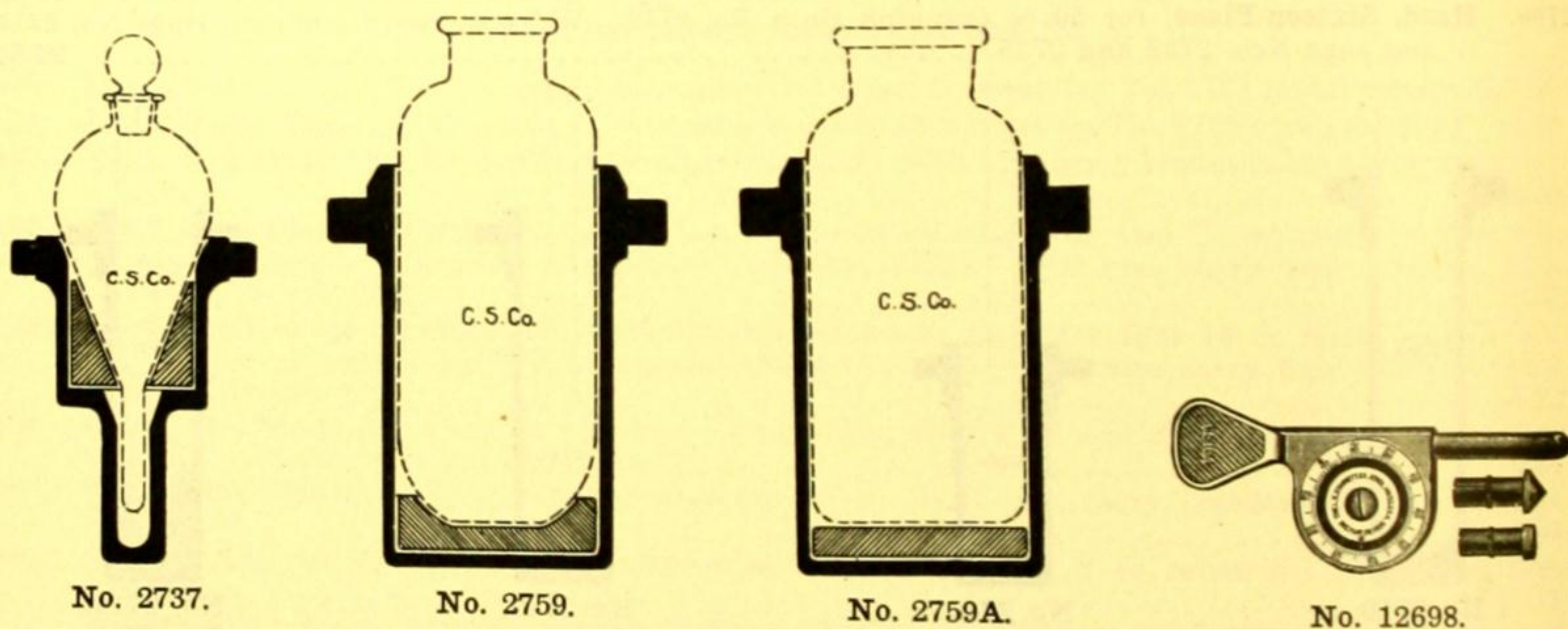
No. 2710.
No. 2711.No. 2712.
No. 2715.No. 2713.
No. 2715.No. 2714.
No. 2715.

Fittings for International Centrifuge Heads.

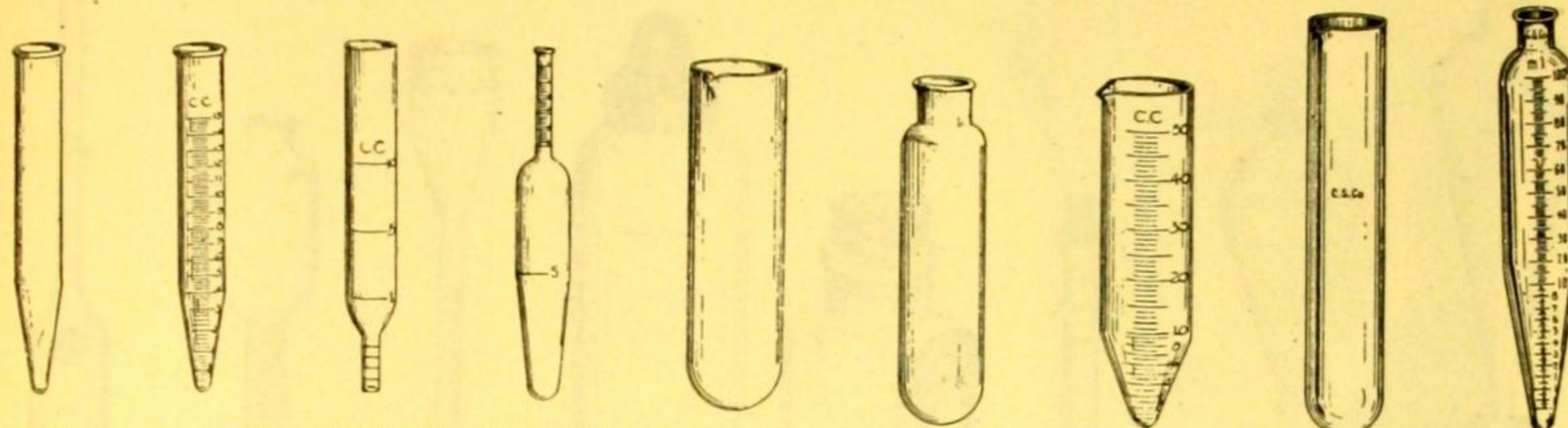
2710. Metal Shield, for 100 cc glass tubes Nos. 2716 and 2716A. For use in No. 2711 trunnion ring. With rubber cushion. \$ 1.00
2711. Trunnion Ring, for 100 cc metal shields No. 2710. For use with heads Nos. 2681, 2685 and 2706 on size No. 2 centrifuge only.50
2712. Metal Cup, for 9 inch Babcock bottles. For use with No. 2715 trunnion ring on head No. 2708 on size No. 2 centrifuge only. With rubber cushion. 1.05
2713. Metal Cup, Special Long, for 9 inch Babcock bottles. For use with No. 2715 trunnion ring on heads Nos. 2681, 2685 and 2706 on size No. 2 centrifuge only. With rubber cushion. 1.45
2714. Metal Shield, for 100 cc tapered glass oil tubes. For use with No. 2715 trunnion rings on heads Nos. 2681, 2685 and 2706 on size No. 2 centrifuge only. With rubber cushion. 1.75
2715. Trunnion Ring, for metal shields Nos. 2712, 2713 and 2714. For use with heads Nos. 2681, 2685, 2706 and 2708 on size No. 2 centrifuge only.55



2728. **Metal Shield**, for 10 to 15 cc glass tubes Nos. 2738, 2739, 2742 and 2743. For use in trunnion ring No. 2731 or attached trunnion rings on heads Nos. 2678, 2679, 2682 and 2683. With rubber cushion \$.70
2731. **Trunnion Ring**, for 15 cc metal shields No. 2728. For use with heads Nos. 2681, 2685 and 2706 on size No. 2 centrifuge only..... .60
2729. **Reducing Cap**, by means of which glass tubes Nos. 2738, 2739 and 2742 may be used in metal shield No. 2730..... .20
2730. **Metal Shield**, for 50 cc glass tubes Nos. 2744, 2745, 2746 and 9170. For use in trunnion ring No. 2732. With rubber cushion..... .85
2732. **Trunnion Ring**, for 50 cc metal shields No. 2730. For use with heads Nos. 2681, 2682, 2683, 2685, 2706 and 2708..... .50
2733. **Babcock Test Trunnion Cup**, for 6 inch Babcock milk bottles. For use on heads Nos. 2681, 2682, 2683, 2685, 2706 and 2708. With rubber cushion80
2735. **Trunnion Cup, Square**, for sputum bottles No. 2757. For use on heads Nos. 2681, 2682, 2683, 2685, 2706 and 2708. With rubber cushion..... 2.05
2736. **Trunnion Carrier**, for 150 cc Squibb separatory funnels No. 2748. For use with heads Nos. 2684, 2704, 2705 and 2706..... 2.70



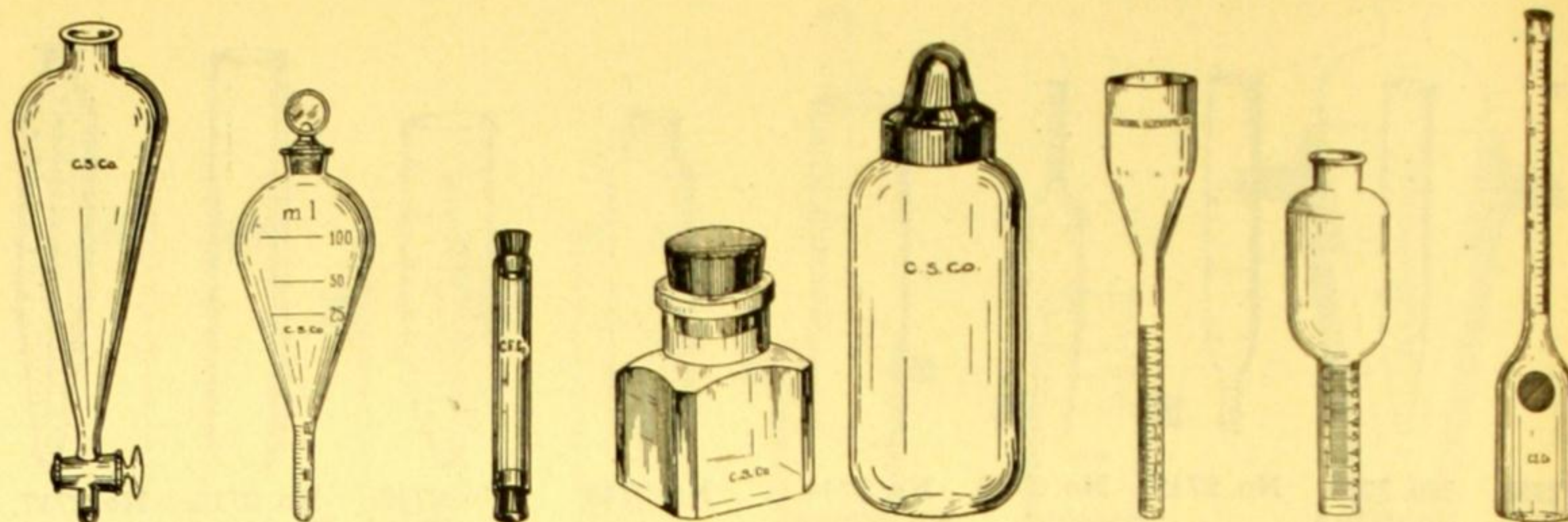
2737. **Trunnion Carrier**, for Goetz tubes No. 2749. For use with heads Nos. 2684, 2704, 2705 and 2706. With rubber cushion..... 3.00
2759. **Trunnion Carrier**, for 250 cc "Sterilizer" bottles No. 2760. For use with heads Nos. 2684, 2704, 2705 and 2706. With No. 2762 rubber cushion 4.50
- 2759A. **Trunnion Carrier**, same as No. 2759 but furnished with No. 2763 rubber cushion. Will carry No. 1578—8 ounce, flat bottom bottles..... 4.50
12698. **Speed Indicator**, improved form, may be run at highest speed required without heating. The rotating disk being carried by friction, may be easily moved to the starting point where the raised knobs coincide. Pressing the raised knob on the rotating disk with the thumb prevents the disk from moving until the hand of the watch gets to the right position to take the time. Every hundred revolutions may be noted by feeling the knob pass under the thumb, thus relieving the eye which has only to look on the watch to note the time. Nickel-plated... 1.50



No. 2738. No. 2739. No. 2742. No. 2743. No. 2744. No. 2745. No. 2746. No. 2716. No. 2717.
 No. 2738A. No. 2739A. No. 2744A. No. 2746A. No. 2716A. No. 2717A

Glassware for use with Nos. 1 and 2 International Centrifuges.

2738. Glass Tubes, Plain, 15 cc, with conical bottoms. For use in No. 2728 metal shield or in No. 2730 metal shield equipped with No. 2729 reducing cap each, \$.12
 per dozen, 1.20
 per gross, 12.00
- 2738A. Glass Tubes, Plain, 15 cc, same as No. 2738 but of Pyrex glass..... each, .28
 per dozen, 3.00
 per gross, 30.25
2739. Glass Tubes, Graduated, 15 cc, with conical bottoms, graduated in 1/10 cc divisions to 10 cc and 1 cc divisions to 15 cc. For use in No. 2728 metal shield or in No. 2730 metal shield equipped with No. 2729 reducing cap..... each, .45
 per dozen, 4.80
 per gross, 49.00
- 2739A. Glass Tubes, Graduated, 15 cc, same as No. 2739 but of Pyrex glass..... each, 1.00
 per dozen, 10.80
2742. Vaccine Tube, Hopkins, for vaccine standardization. To contain 10 cc vaccine, stem graduated in 0.05 cc by 0.01 cc. For use in No. 2728 metal shield or in No. 2730 metal shield equipped with No. 2729 reducing cap..... .60
2743. Babcock Tube, Human Milk, with stem graduated in per cent. of fat, each division representing 0.2 per cent. fat, when 5 cc of milk is used. For use in No. 2728 metal shield..... .45
2744. Glass Tubes, Plain, 50 cc, with lip and round bottom. For use in No. 2730 metal shield.
 each, .20
 per dozen, 2.15
 per gross, 21.50
- 2744A. Glass Tubes, Plain, 50 cc, same as No. 2744 but of Pyrex glass..... each, .45
 per dozen, 4.80
 per gross, 51.85
2745. Glass Tubes, Plain, 50 cc, with narrow neck and round bottom. For use in No. 2730 metal shield.
 each, .33
 per dozen, 3.60
 per gross, 38.00
2746. Glass Tubes, Graduated, 50 cc, with short tapered bottoms and pourout. Graduated in 1/2 cc divisions to 10 cc and in 1 cc divisions to 50 cc. For use in No. 2730 metal shield. each, .60
 per dozen, 6.48
- 2746A. Glass Tubes, Graduated, 50 cc, same as No. 2746 but of Pyrex glass..... each, 1.40
 per dozen, 15.00
2716. Glass Tubes, Plain, 100 cc, with lip and round bottom. For use in No. 2710 metal shield.
 each, .30
 per dozen, 3.20
 per gross, 34.50
- 2716A. Glass Tubes, Plain, 100 cc, same as No. 2716 but of Pyrex glass..... each, .50
 per dozen, 5.40
2717. Glass Oil Tubes, Graduated, 100 cc, with tapered bottom and narrow neck. Graduated in 1/20 cc divisions to 1 cc, 1/10 cc divisions to 6 cc, 1/2 cc divisions to 10 cc and 1 cc divisions to 100 cc. For use in No. 2714 metal shield..... each, 1.50
 per dozen, 16.20
- 2717A. Glass Oil Tubes, Graduated, 100 cc, same as No. 2717 but of Pyrex glass..... each, 2.50
 per dozen, 27.00

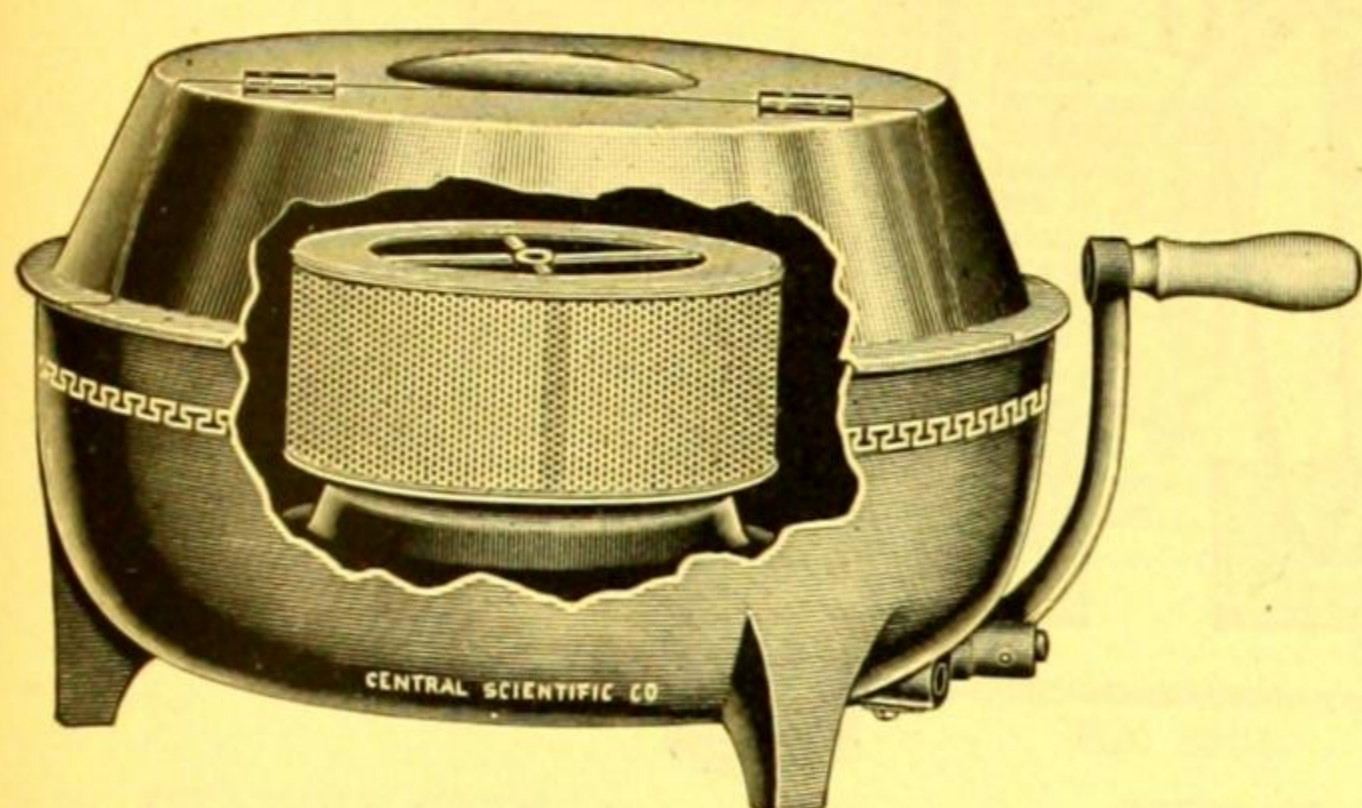


No. 2748. No. 2749. Nos. 2750-2751. No. 2757. Nos. 2760 and 2764. No. 2765. No. 9170. No. 9120.

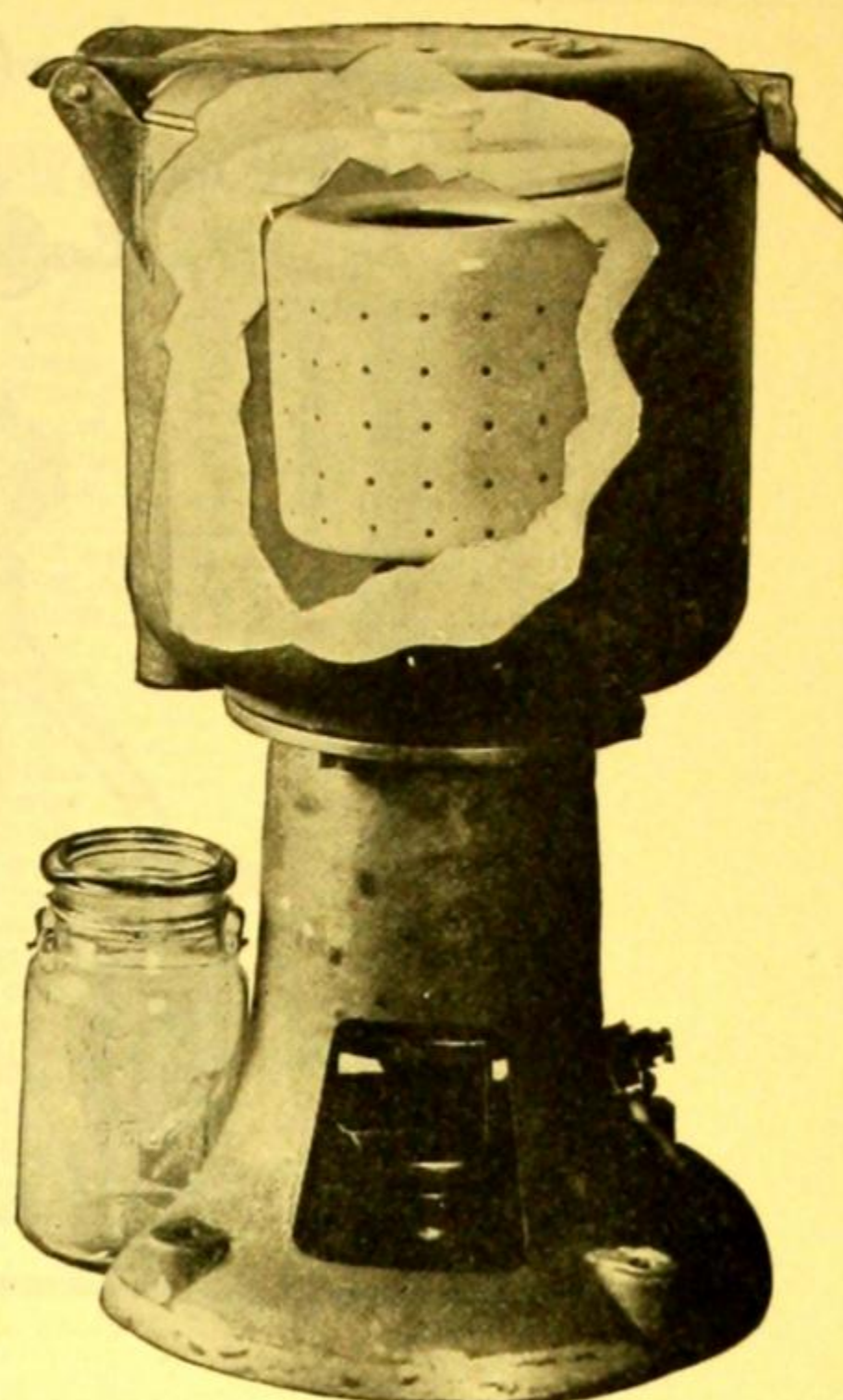
2748. Squibb Glass Separatory Funnel, 150 cc. For use in No. 2736 trunnion carrier..... \$ 2.85
2749. Goetz Glass Phosphorus Tube, graduated at 25, 50 and 100 cc and with stem graduated in 0.002 cc divisions to 0.2 cc, with glass stopper. For use with No. 2737 trunnion carrier with No. 2761 rubber cushion 2.85
2750. Milk Sediment Tubes, Board of Health, 2 cc capacity. For use in No. 2686 disk per hundred, 4.25
2751. Rubber Stoppers, for No. 2750 milk sediment tubes per hundred, 4.50
2757. Sputum Bottles, Square, 10 cc capacity, with corks. For use in No. 2735 trunnion carrier.
per dozen, .85
per gross, 9.25
2760. Sterilizer Bottles, 250 cc, with narrow neck and round bottom. For use in No. 2759 trunnion carrier per dozen, 2.10
1578. Glass Bottles, Wide Mouth, 8 oz., flint glass. For use in No. 2759A trunnion carrier per dozen, 1.40
per gross, 13.75
2765. Potash Tube, Sherrill, with wide top and capillary stem graduated by 0.1 per cent. to 15.0 per cent. of K_2O . (See Journal of Ind. and Eng. Chem., Vol. XIII, No. 3 for March 1921, page 227.) For use in No. 2710 metal shield..... 2.00
9170. Casein Tube, Hart's, for estimating the amount of casein in milk, 50 cc capacity with stem graduated to 0.2 per cent. casein. For use in No. 2730 metal shield..... .40
9102. Babcock Milk Test Bottle, 6 inch, 18 gram, 8 per cent. Graduated to 1/10 per cent. For use in No. 2733 trunnion cup..... each, .28
per dozen, 3.00
9114. Babcock Cream Test Bottle, 6 inch, 9 gram, 50 per cent. Graduated to 1/2 per cent. For use in No. 2733 trunnion cup..... each, .40
per dozen, 4.30
9120. Babcock Cream Test Bottle, 9 inch, 18 gram, 30 per cent. Graduated to 0.2 per cent. For use in No. 2712 and No. 2713 metal cups..... each, .40
per dozen, 4.30
9122. Babcock Cream Test Bottle, 9 inch, 18 gram, 50 per cent. Graduated to 1/2 per cent. For use in No. 2712 and No. 2713 metal cups..... each, .45
per dozen, 4.90
9092. Babcock Butter Test Bottle, 9 inch, 9 gram, 90 per cent. Graduated to 1/2 per cent. For use in No. 2712 and No. 2713 metal cups..... each, .55

Rubber Cushions for International Centrifuge Shields and Trunnion Cups.

2718. Rubber Cushions, for No. 2710 metal shields when used with 100 cc round bottom glass tubes.
each, .20
per dozen, 1.92
2719. Rubber Cushions, for No. 2714 metal shield when used with 100 cc tapered glass oil tubes.
each, .60
2722. Rubber Cushions, for Nos. 2712, 2713 and 2733 metal Babcock cups..... per dozen, .55
2753. Rubber Cushions, for No. 2728 metal shield for 15 cc glass tubes..... per dozen, .72
2754. Rubber Cushions, for No. 2730 metal shield for 50 cc glass tubes..... per dozen, 1.44
2761. Rubber Cushions, for No. 2737 trunnion carrier for Goetz tubes No. 2749..... each, .75
2762. Rubber Cushions, for No. 2759 trunnion carrier for No. 2760 sterilizer bottles..... each, .50
2763. Rubber Cushions, for No. 2759A trunnion carrier for No. 1578—8 ounce bottles..... each, .30
2755. Rubber Caps, for glass tubes Nos. 2738, 2738A, 2739 and 2739A..... per dozen, 3.00
2756. Rubber Caps, for glass tubes No. 2745..... per dozen, 3.25
2764. Rubber Caps, for glass sterilizer bottles No. 2760 per dozen, 3.60



No. 2770.



No. 2772 (Shown with a collecting jar).

2770. **CENTRIFUGAL MACHINE, Hand**, for chemical use, consisting of Milk Testing Centrifuge No. 9204C, fitted with a heavily tinned perforated copper basket $7\frac{3}{8}$ inches in diameter and $3\frac{1}{4}$ inches deep, with $\frac{1}{2}$ inch flange at the top. Can be used for a variety of purposes, such as drying crystals, etc. Where corrosive materials are used, the inside of the iron case should be coated with some resistant material, such as paraffine or acid-proof varnish. The case is provided with an outlet at the bottom for draining \$30.00

- 2772 **CENTRIFUGAL MACHINES**, of acid proof construction, with porcelain basket, and cast iron draining chamber and cover coated with acid resisting enamel. Especially adapted for determining yield of sugar in refinery laboratories, and for drying crystals in the experimental manufacture of chemical salts. The centrifuge is housed in a cast iron frame with enclosed direct connected motor with special bearings. The enameled cast iron draining chamber has an outlet at the bottom and the base is cut away to allow a collecting jar to be placed beneath the outlet. Complete with rheostat for speed control, perforated porcelain basket 6 inches in diameter and interchangeable four-tube head with set of 10 cc plain glass tubes. Dimensions: height over all with cover closed, 22 inches; with cover open, $34\frac{1}{2}$ inches; diameter of cast iron chamber outside, 11 inches; maximum speed permissible with porcelain basket, 2500 r. p. m.; speed with four-tube head, 3000 r. p. m.; shipping weight, 160 pounds.

No.	A	B	C	D
	A. C.		D. C.	
For volts	110	220	110	220
Each	160.00	160.00	160.00	160.00

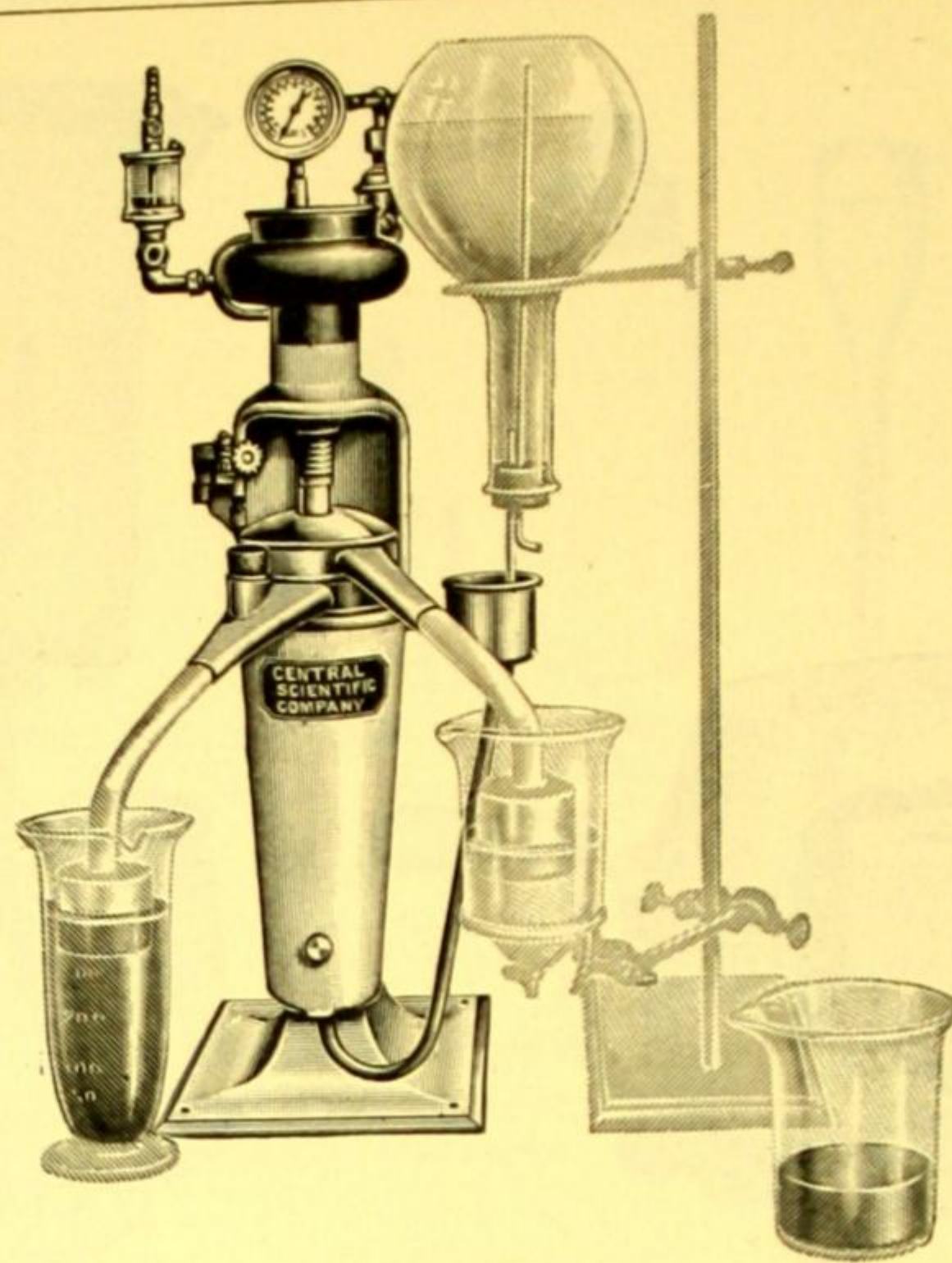
Note:—If larger centrifuges are desired than the preceding, information will be furnished and prices quoted upon receipt of specifications giving purpose for which used, size of basket or number of tubes, speed desired, character of driving power, etc.

2774. Perforated Porcelain Basket, 6 inches in diameter 30.00
2776. Perforated Bronze Basket, 8 inches in diameter 32.40

CENTRIFUGES, Babcock or Milk Testing, see **Milk Testing Apparatus**.

CENTRIFUGES, Moisture Equivalent, see **Soil Analysis Apparatus**.

CENTRIFUGES, Soil, see **Soil Analysis Apparatus**.



No. 2784.

2784. **CENTRIFUGAL MACHINE, Sharples Super-Centrifuge.** A laboratory centrifugal designed for the application of extreme speed and centrifugal force to a continuous stream of liquid. The rate at which the liquids may be clarified depends upon the size of the particles to be precipitated. With the maximum centrifugal force attainable (41,250 times gravity) colloid particles just visible with an ultra-microscope may be separated from liquids on continued application of this force. Fractional precipitation of suspended matter may be accomplished by properly regulating the speed of the machine, as there is a critical force, depending on the density of the particle, below which it is practically impossible to precipitate it owing to the force of surface tension opposing its subsidence. By passing the liquid repeatedly through the machine and increasing its speed each time the particles will be removed in the order of their density.

By means of this centrifuge colloidal particles may be separated from liquids; bacteria and impurities may be removed from hot agar solutions; calcium soaps from wool fat, and oil soap and fatty acids from gelatine; water from fusel oil; suspended matter from lacquers, acids, glue, etc.; sulphuric acid from oil; pigments from paints and varnishes, and many other determinations and separations made which otherwise can be effected not at all or with great difficulty. Especially valuable in the chemical laboratory for slow filtering precipitates such as ferric hydrate, ammonium phosphomolybdate, arsenic sulphide, etc., in routine analysis.

The machine consists essentially of an iron frame cast in one piece. Within this is suspended a seamless tubular tin-lined steel bowl, by means of a flexible spindle, with a cone at its upper end, running on ball bearings. By means of the cone bearings, wear is automatically taken up. At the lower end of the bowl is a guide or drag which keeps the bowl centered and absorbs vibrations. Parts are easily removed for cleaning and can be readily and economically replaced when worn.

The liquid comes in contact only with tinned surfaces except in passing through the feed nozzle, which is of nickel; consequently weak acids or alkalis may be handled continuously or stronger reagents for brief periods. If desired the machine parts may be obtained plated with gold, silver, or platinum, at an additional charge.

The machine is 24 inches high and weighs 50 pounds. At the base it measures $10\frac{1}{2}$ by 8 inches. The inner bowl, which is 2 inches in diameter, has a capacity of 250 cc. A turbin wheel is attached to the shaft for driving with compressed air or steam at 22 pounds pressure at the maximum speed of 40,000 r. p. m. When operated by compressed air, 16 cu. ft. are required per minute, and with steam, 100 pounds of water are required per hour. Complete with steel bowl and speed indicator..... \$150.00

2789. **CENTRIFUGAL MACHINE, Sharples Super-Centrifuge, Biological Model.** A modification of the No. 2784 machine to meet the requirements of the medical laboratory more fully. The modifications are only in design to permit easy dismantling for sterilization and to reduce the contact of the liquor with the drag. For biological work only one outlet to the bowl and one delivery spout is required, so one set of these has been eliminated in this model. This machine is particularly well adapted for the preparation of vaccines. Finished in white. Complete with steel bowl and speed indicator..... 160.00

A TABLE OF THE CHEMICAL ELEMENTS WITH THEIR ATOMIC WEIGHTS

COMPILED BY DR. F. W. CLARKE
AND REPORTED TO THE AMERICAN CHEMICAL SOCIETY

NAME	SYMBOL	ATOMIC WEIGHT	NAME	SYMBOL	ATOMIC WEIGHT	NAME	SYMBOL	ATOMIC WEIGHT
Aluminum	Al	27.1	Helium	He	4.0	Rhodium	Rh	102.9
Antimony (Sbium)	Sb	120.2	Hydrogen	H	1.008	Rubidium	Rb	85.45
Argon	A	39.9	Indium	In	114.8	Ruthenium	Ru	101.7
Arsenic	As	75.0	Iodine	I	126.92	Samarium	Sa	150.4
Barium	Ba	137.37	Iridium	Ir	193.1	Scandium	Sc	44.1
Bismuth	Bi	208.0	Iron (Ferrum)	Fe	55.85	Selenium	Se	79.2
Boron	B	11.0	Krypton	Kr	81.8	Silicon	Si	28.3
Bromine	Br	79.92	Lanthanum	La	139.0	Silver (Argentum)	Ag	107.88
Cadmium	Cd	112.40	Lead (Plumbum)	Pb	207.10	Sodium (Natrium)	Na	23.00
Caesium	Cs	132.81	Lithium	Li	7.00	Strontium	Sr	87.62
Calcium	Ca	40.09	Lutecium	Lu	174.0	Sulphur	S	32.07
Carbon	C	12.00	Magnesium	Mg	24.32	Tantalum	Ta	181.0
Cerium	Ce	140.25	Manganese	Mn	54.93	Tellurium	Te	127.5
Chlorine	Cl	35.46	Mercury (Hydrargyrum)	Hg	200.0	Terbium	Tb	159.2
Chromium	Cr	52.1	Molybdenum	Mo	96.0	Thallium	Tl	204.0
Cobalt	Co	58.97	Neodymium	Nd	144.3	Thorium	Th	232.42
Columbium (Niobium)	Cb	93.5	Neon	Ne	20.0	Thulium	Tm	168.5
Copper (Cuprum)	Cu	63.57	Nickel	Ni	58.68	Tin (Stannum)	Sn	119.0
Dysprosium	Dy	162.5	Nitrogen	N	14.01	Titanium	Ti	48.1
Erbium	Er	167.4	Osmium	Os	190.9	Tungsten (Wolframium)	W	184.0
Europium	Eu	152.0	Oxygen	O	16.00	Uranium	U	238.5
Fluorine	F	19.0	Palladium	Pd	106.7	Vanadium	V	51.2
Gadolinium	Gd	157.3	Phosphorus	P	31.0	Xenon	Xe	128.0
Gallium	Ga	69.9	Platinum	Pt	195.0	Ytterbium (Neoytterbium)	Yb	172.0
Germanium	Ge	72.5	Potassium (Kalium)	K	39.10	Yttrium	Y	89.0
Glucium (Beryllium)	Gl	9.1	Praseodymium	Pr	140.6	Zinc	Zn	65.37
Gold (Aurum)	Au	197.2	Radium	Ra	226.4	Zirconium	Zr	90.6

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MANUFACTURED AND REPORTED BY
LABORATORY APPARATUS
AND SUPPLIES

No. 2804.

2800. CHAMOIS SKIN, for cleaning instruments, etc.

No.	A	B	C	D
Size, inches	6x8	9x11	10x13	14x18
Each	\$0.12	.28	.38	1.00
1478. CHARCOAL STICKS, natural willow wood, 4x1x1/2 inches			per dozen	1.10

10% discount in lots of 144.

2804. CHART, Atomic Weight. Compiled by Dr. F. W. Clarke and reported to the American Chemical Society. Size 42x62 inches. Mounted on linen back on common rollers. 3.60

PERIODIC CLASSIFICATION OF THE ELEMENTS

ACCORDING TO MENDELEJEFF
ON BASIS O=16

Series	Group 0	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
1		H=1							
2	He-4	Li-7	Be-9	B-11	C-12	N-14	O-16	F-19	
3	Ne-20	Na-23	Mg-24	Al-27	Si-28	P-31	S-32	Cl-35	
4	A-39	K-39	Ca-40	Sc-44	Ti-48	V-51	Cr-52	Mn-55	(Fe-55)
5			Zn-65	Ga-70	Ge-72	As-75	Se-79	Br-80	Ni-58
6	Kr-84	Rb-85	Sr-88	Y-89	Zr-90	Nb-93	Mo-96		Co-59
7		Ag-108	Cd-112	In-115	Sn-119	Sb-122	Te-128	I-127	(Ru-101)
8	Xe-131	Cs-133	Ba-137	La-139	Ce-140				Rh-103
9									Pd-106
10						Ta-181	W-184		
11		Au-197	Hg-200	Tl-204	Pb-206	Bi-208			(Os-191)
12			Ra-226		Th-232		U-238		Ir-193

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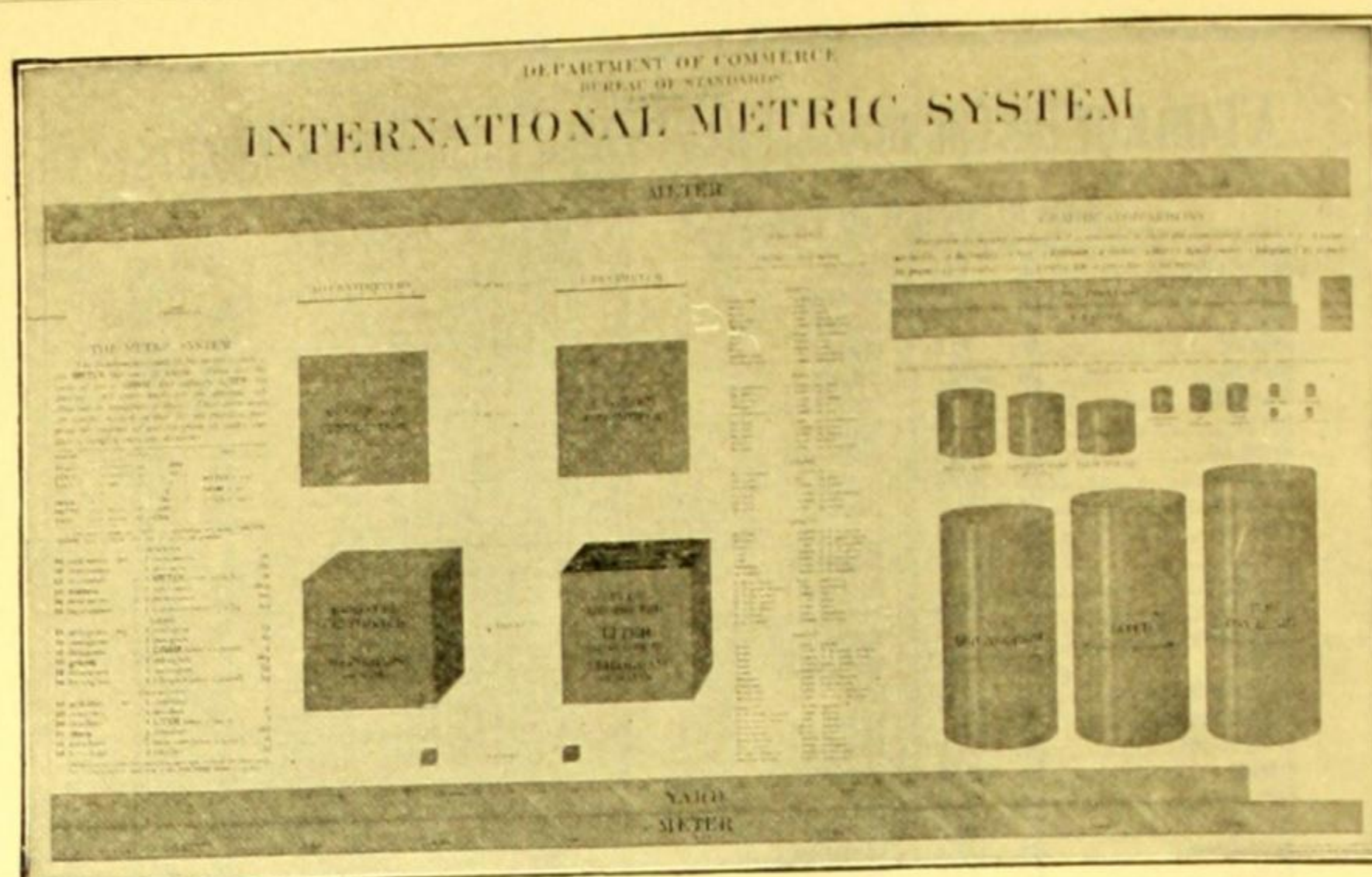
SOME OF RARER ELEMENTS NOT LOCATED - PLACE UNCERTAIN

MANUFACTURED AND REPORTED BY
LABORATORY APPARATUS
AND SUPPLIES

No. 2806.

2806. CHART, Mendelejeff Periodic System. The periodic arrangement of the elements according to Mendelejeff, on the basis of O=16. American nomenclature. Size 42x62 inches. Mounted on linen back on common rollers. 3.60

CHARTS, for Botany, Zoology and Physiography, send for special bulletin.



No. 2807.

2807. **CHART, Metric**, showing in full size and in perspective where necessary the units of the international metric system, with units of the English system for comparison. Tables showing the derivation of the names of the metric units and their abbreviations, together with tables of metric and English equivalents are included. The chart is 25 by 41 inches, mounted on cloth back, with common rollers. \$2.00
2808. **CHART, Spectrum**, showing 6 spectrum and 12 intermediate colors with two tints and two shades of each. A chart of approximately complementary colors, one showing the relative value of spectrum colors as obtained by a prism, and a set of grays, showing eight tones are included. Made of stiff cardboard, folded, opening out to 14x22 inches. 2.00
2812. **CHART, Spectrum**, mounted on linen back with common rollers and containing the following spectra (size of each spectrum 5.5 cm wide, 52 cm long): K, Rb, Cs, Tl, Na, Li, Ca, Sr, Ba. Length, 100 cm; width, 70 cm. 5.75
2814. **CHART, Spectrum**, same as No. 2812, with the following spectra: In, C, Bo, Mn, Pb, Cu, Co, Ni, Fe. 5.50

2815. **CHART, Stain Removal (Anti-Stain Formulary)**. A disk divided into 16 sectors, each with the name of a staining agent, revolves in a frame having a semi-circle on which are the names of 8 kinds of cloth. When the name of the stain is placed opposite the cloth stained, numbers are seen through holes in the disk which refer to a list of cleaning chemicals found on the face of the chart. General directions are printed on the back of the chart, which thus forms a most useful device in the laboratory. postpaid .15



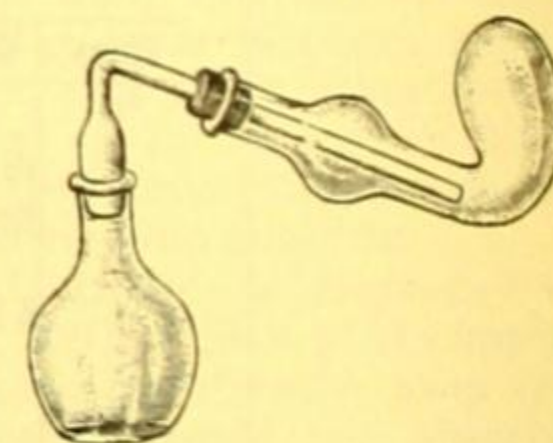
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No. 2818.



No. 2820.



No. 2828.

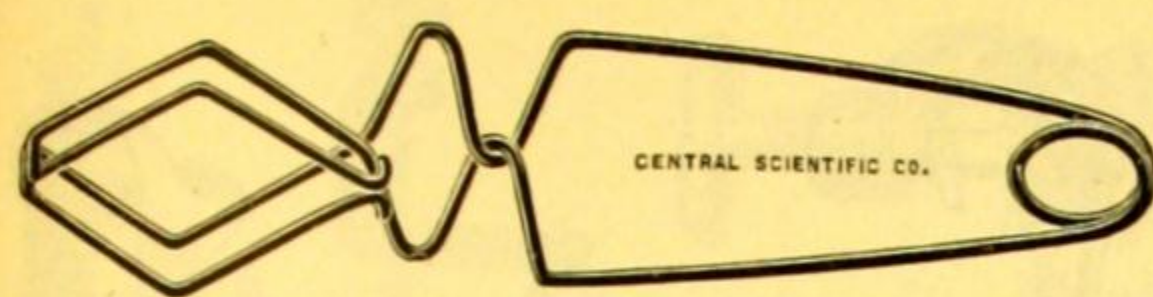


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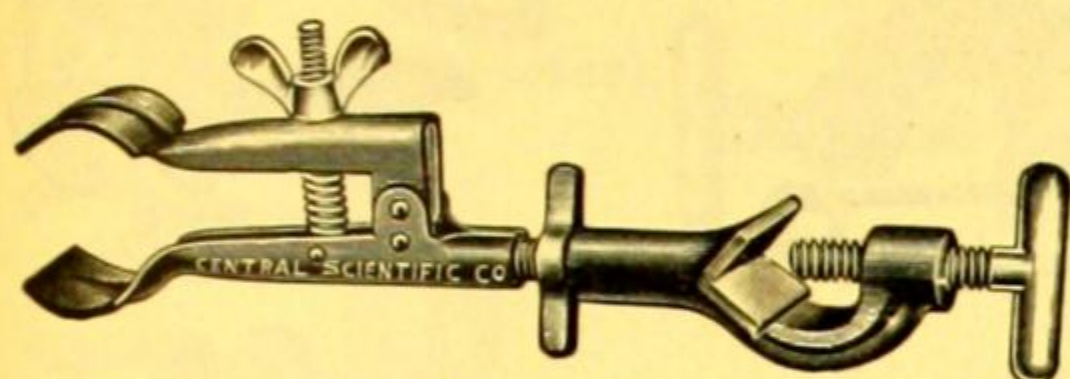


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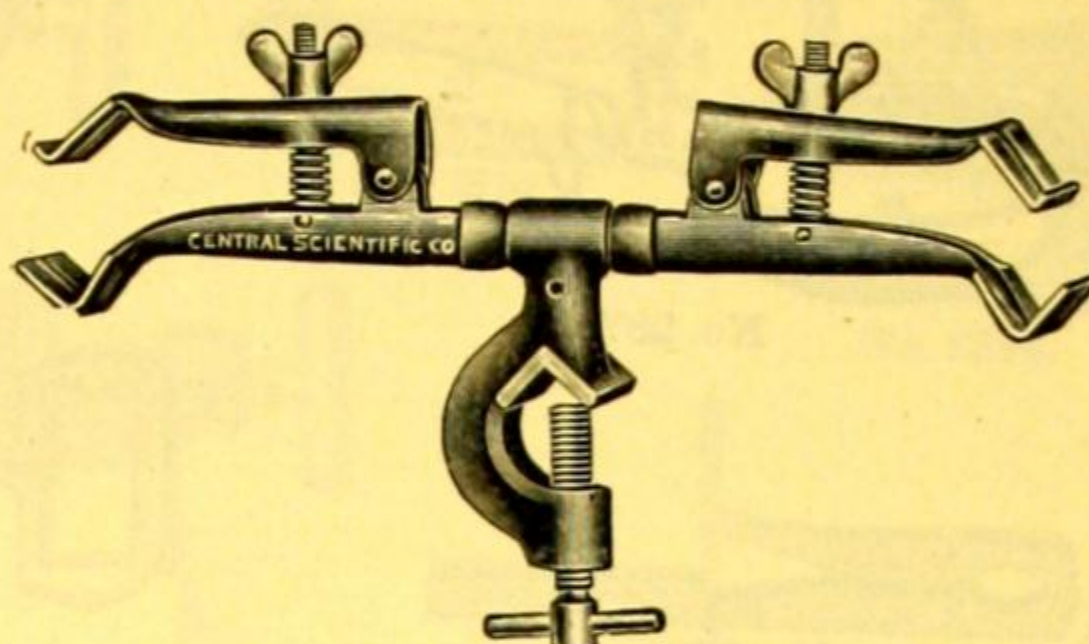
2816. **CHEESE-CLOTH** per yard .12
10% discount in lots of 10 yards. 25% discount in roll of 100 yards.
2818. **CHIMNEYS, Students' Lamp** per dozen 2.00
2820. **CHIMNEYS, Argand, straight, 2x7 inches** per dozen 1.90
- CLAY PIPES, see Pipes, Clay.**
- CLOTH, Emery, see Emery Cloth.**
2822. **CHISEL, Cold, length 6 inches, width of blade 1/2 inch**20
2828. **CHLORINE ABSORPTION APPARATUS, Bunsen-Fresenius, with flask ground on** 3.00
2830. **CHLORINE TUBE, 2x100 cm, for showing decomposition of water by chlorine**60



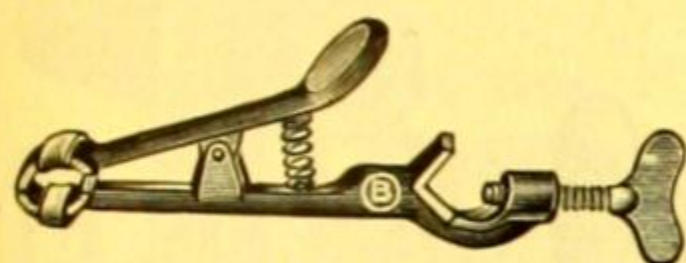
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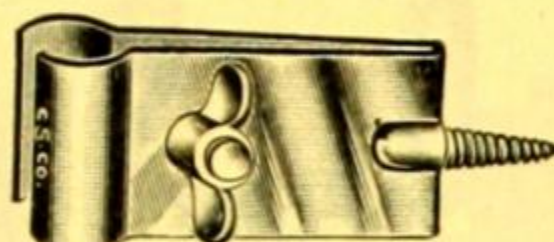
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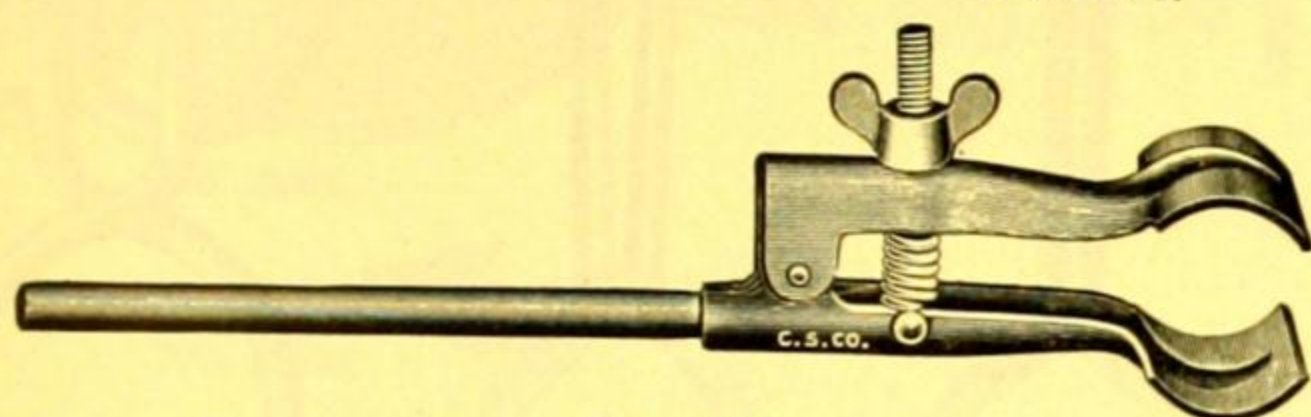
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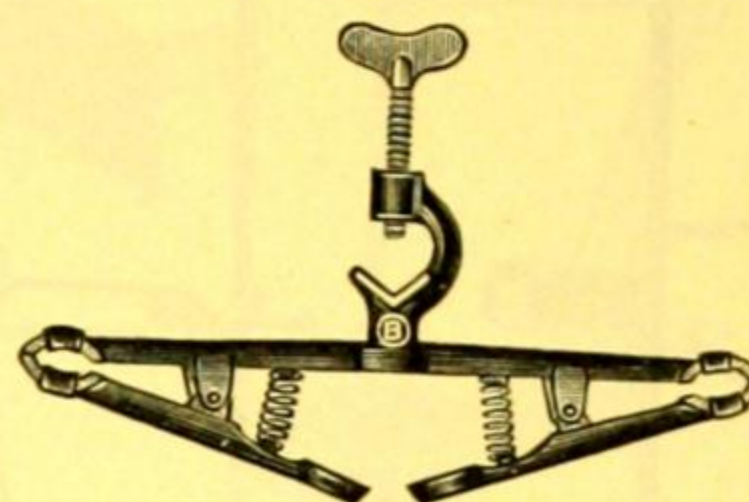
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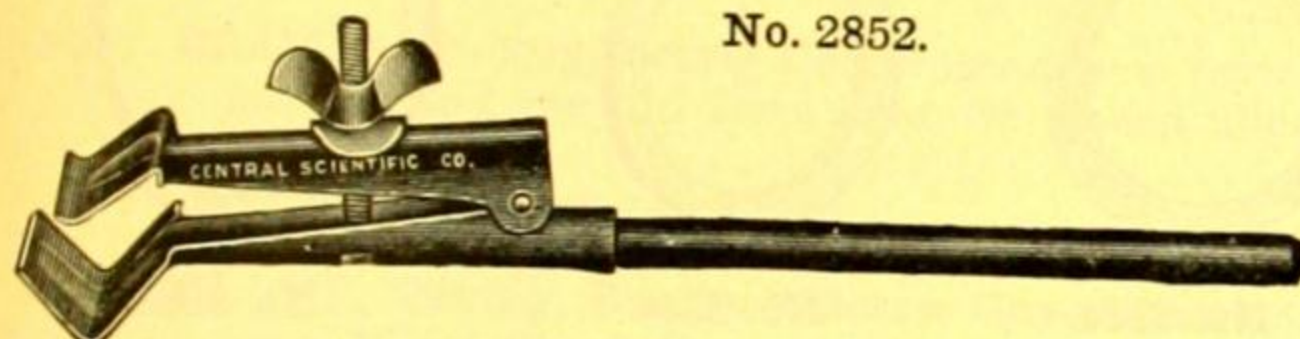
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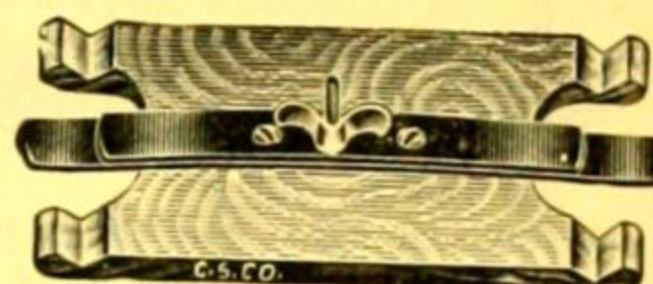
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No. 2856.



No. 2864.



No. 2862.

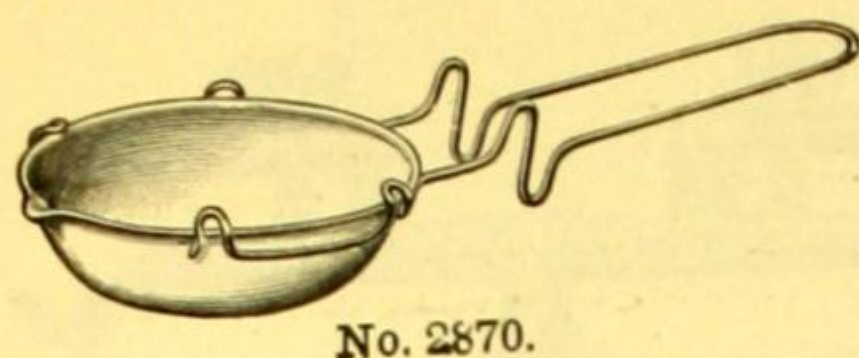
CLAMPS, ALL KINDS

- 2838A. **CLAMP, Beaker, Chaddock's**, for beakers of from 75 to 250 cc capacity..... \$0.25
2840. **CLAMP, Burette**, of stamped steel with rounded jaws; has check nut to adjust to any position, and clamp holder. An excellent clamp for general use..... .50
2842. **CLAMP, Burette**, same as No. 2840, but with jaws rubber covered..... .55
2848. **CLAMP, Burette**, of japanned iron, with coiled spring enabling burette to be adjusted easily and quickly. With rubber covered jaws..... .45
2850. **CLAMP, Burette, or tube**, of brass, nickel-plated, for screwing into wall or shelf. Open in front leaving graduations uncovered for reading..... .50
2852. **CLAMP, Burette, Bunsen**, of stamped steel with rounded jaws, for use with clamp holder No. 2914; for tubes, burettes, etc. Width of opening, 2 inches; total length, 9 inches; diameter of rod, $\frac{3}{8}$ inches..... .40
2854. **CLAMPS, Burette, Bunsen**, same as No. 2852, but with rubber covered jaws..... .45
2856. **CLAMP, Burette, double**, same as No. 2848, for two burettes..... .75
2860. **CLAMP, Burette, Hofmann's**, double..... 1.00
2862. **CLAMP, Burette, double**, designed by Prof. Lincoln of the University of Illinois. Burettes are held perpendicular and are easily removed. A very convenient and rigid clamp, nicely made.90
2864. **CLAMP, Condenser, new form**, with V-shaped jaws of stamped steel, enabling very small tubes to be clamped. For clamping thermometers, burettes, condensers, etc. For tubes up to $2\frac{1}{2}$ inches; total length, 11 inches; diameter of rod, $\frac{3}{8}$ inch..... .55
2865. **CLAMP, Condenser**, same as No. 2864, but with rod 12 inches long. Total length, 17 inches .60
- F151. **CLAMP, Condenser**, same as No. 2864, but with nickel-plated rod 12 inches long..... 1.00

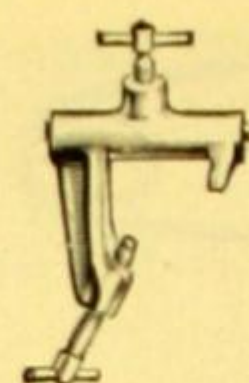
Note.—10% discount in lots of 12, 25% discount in lots of 144 from all prices on this page.

CLAMPS

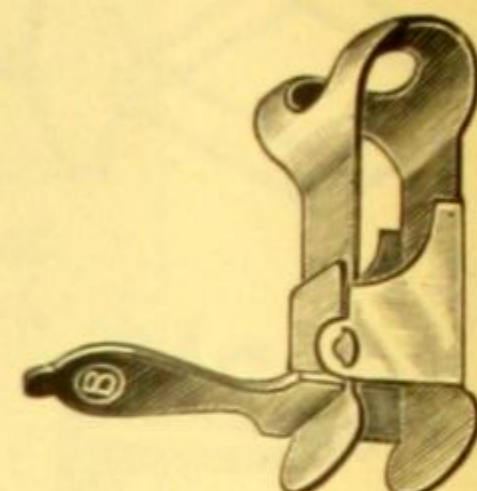
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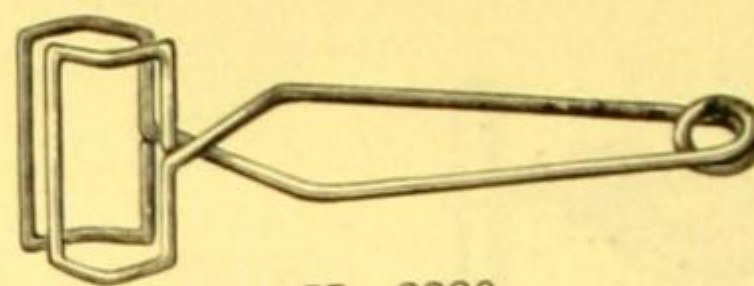
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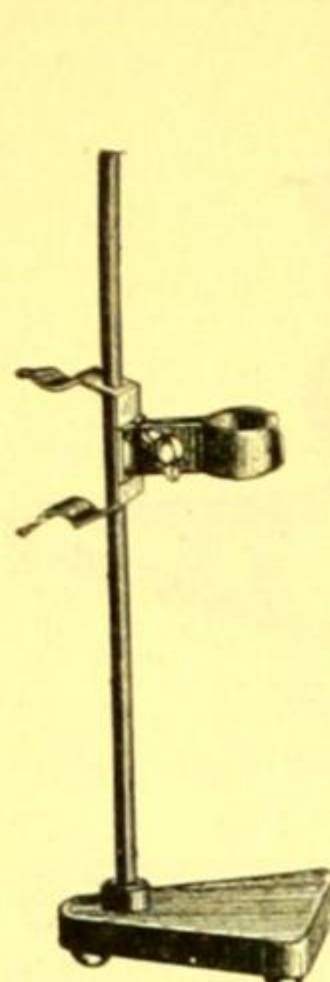
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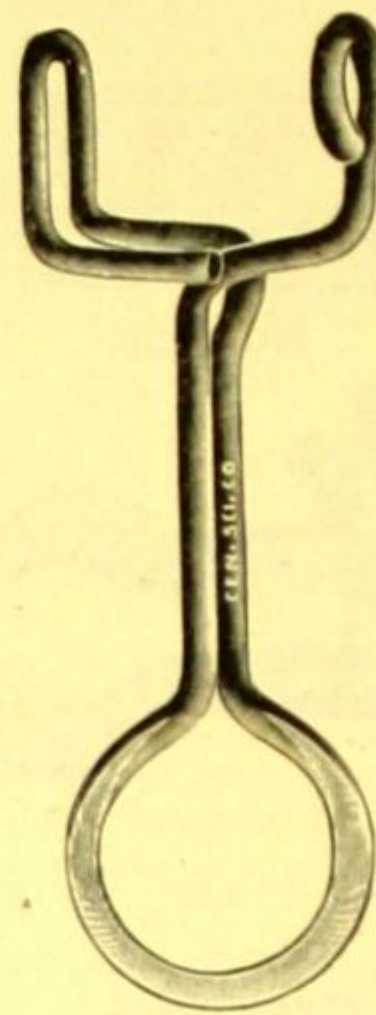
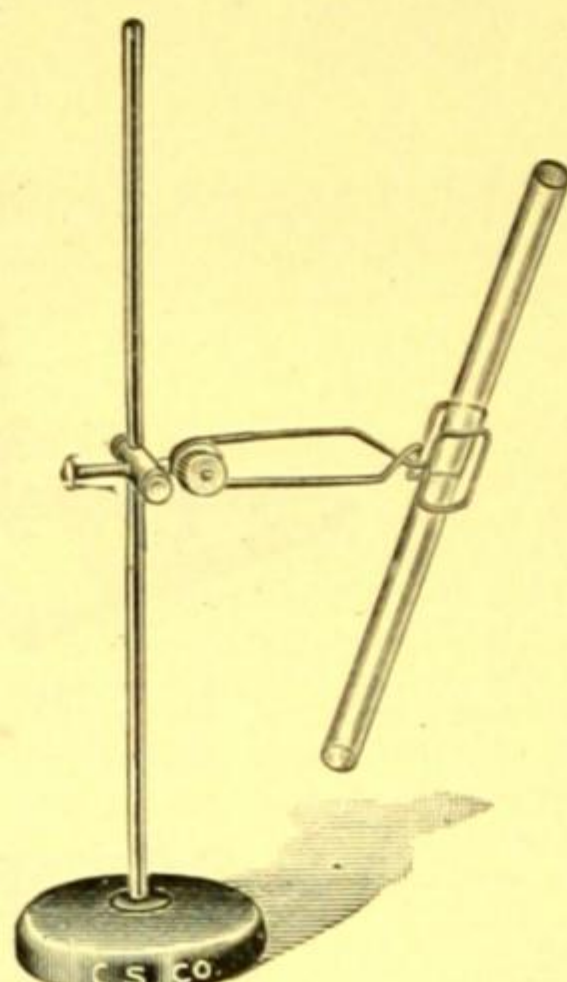
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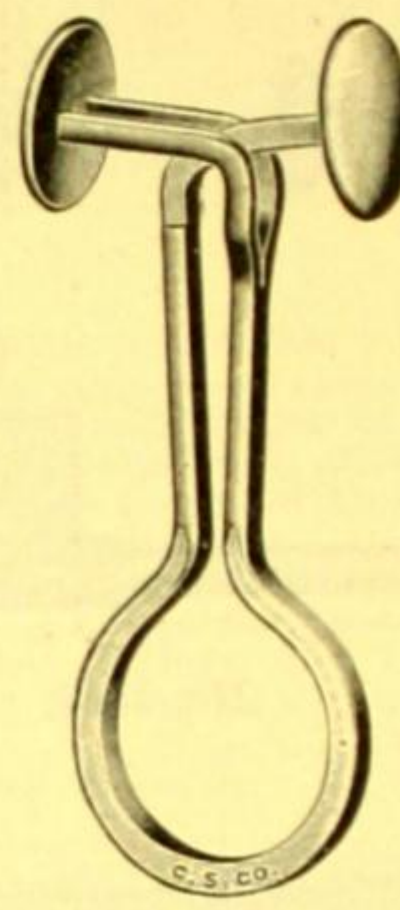
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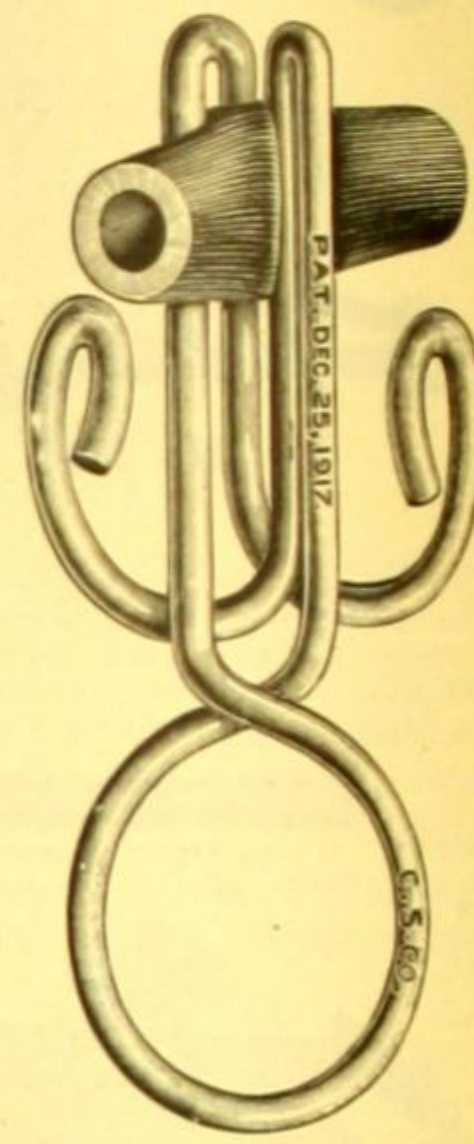
No. 2873
(shown in use No. 2880 (shown with
as part of No. Nos. 2918 and 2922).
10286).



No. 2884.

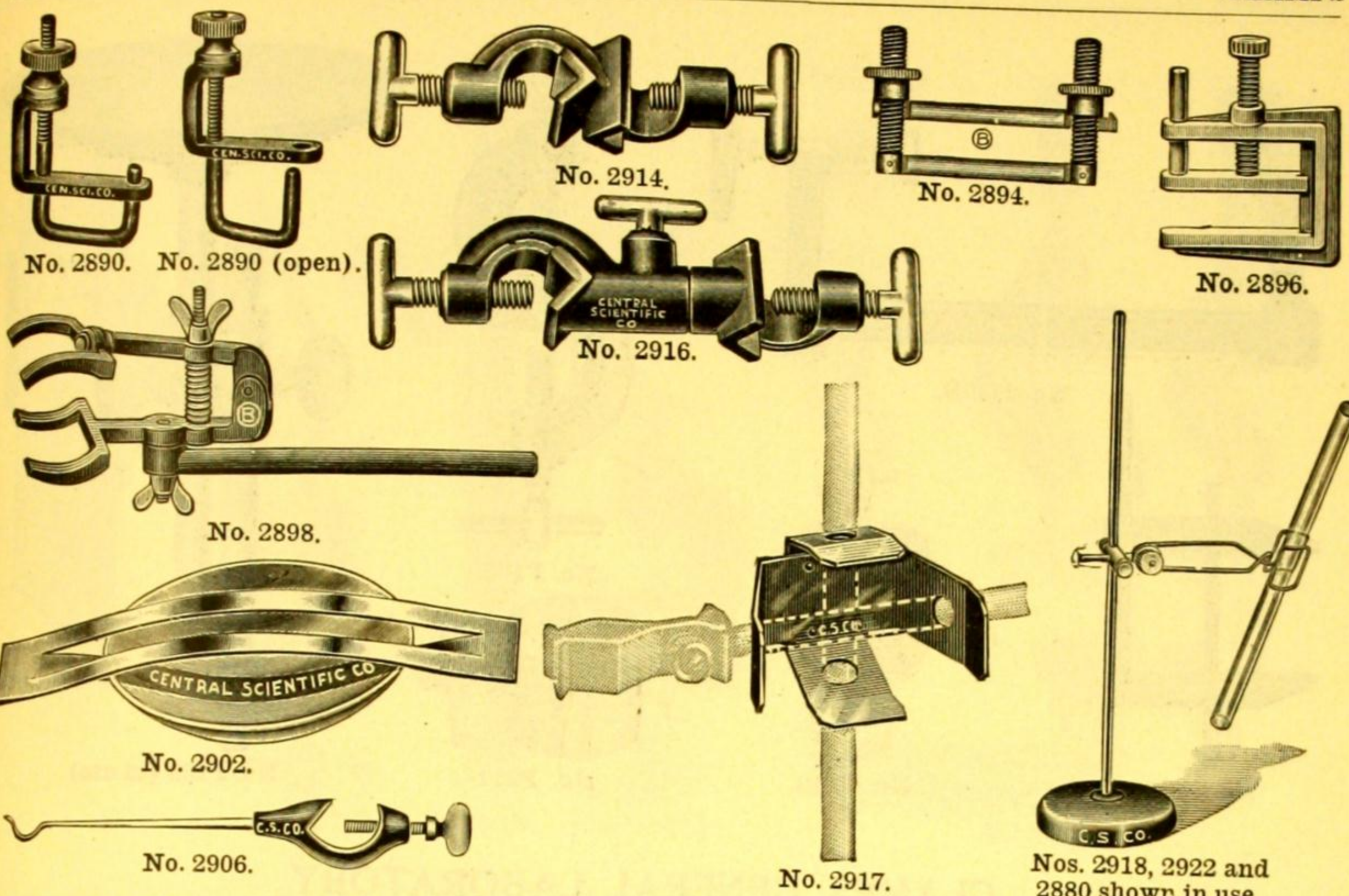


No. 2886.

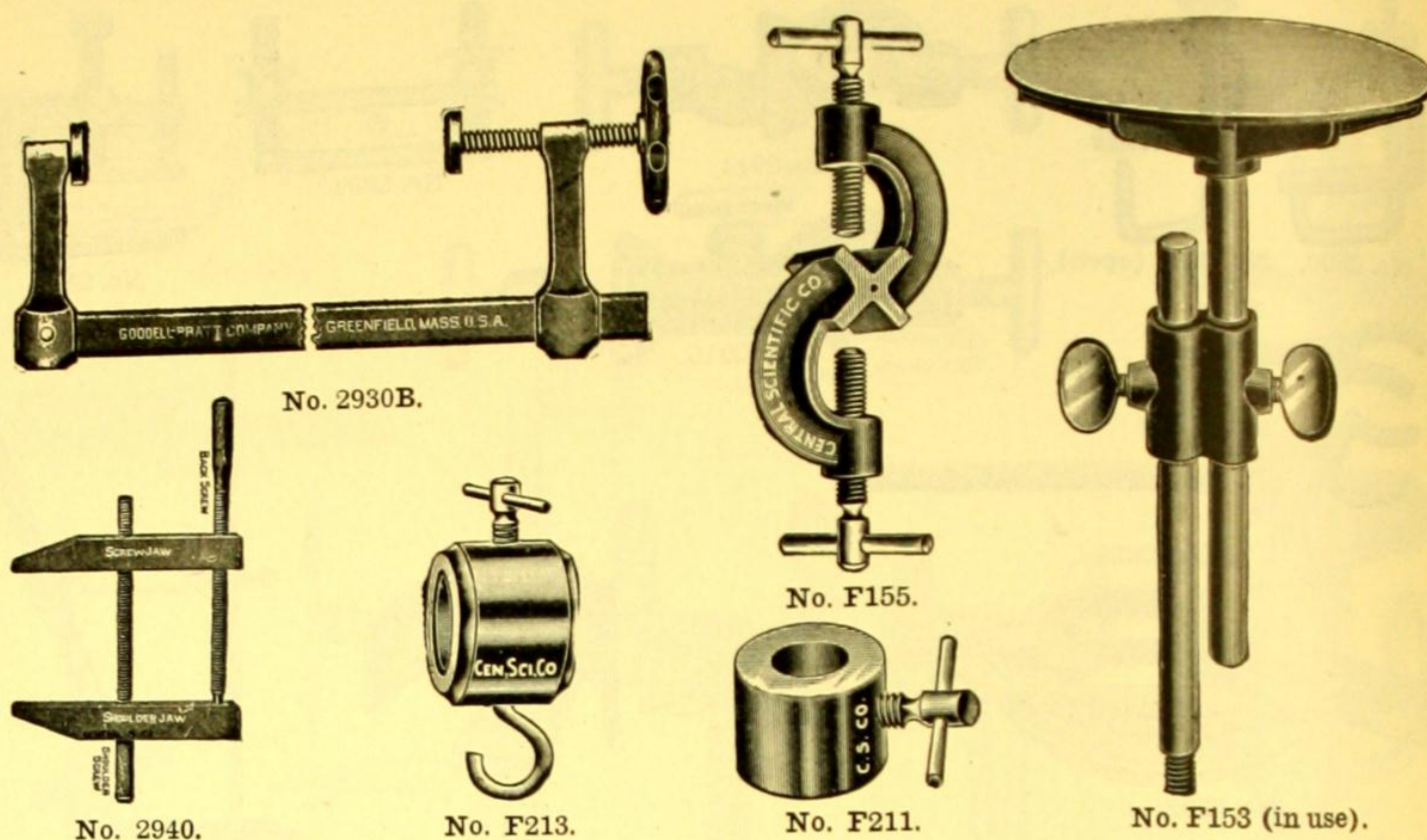


No. 2888.

2870. **CLAMP, Dish, Stoddard's**, of brass, white-plated, for holding evaporating and other dishes up to $4\frac{1}{2}$ inches in diameter..... \$0.15
2873. **CLAMP, Flask or Tube, Cenco friction type**, as used on support stand No. 10286 for holding conductivity cells, small flasks, calomel electrodes, etc. A flexible clamp for holding fragile or expensive glassware without danger of breakage through clamping too tightly. For use on a 6 mm rod. **Without support**..... 1.25
10412. **CLAMP, Rod**, for use on No. 10410 Aquarium Type DeKhotinsky Thermostat for clamping to its side flasks, conductivity cells, etc. Drilled to take a 6 mm rod. By means of No. 2919 Right Angle Clamp, and a short piece of 6 mm rod, No. 10286 Support may be easily attached. A very convenient arrangement is shown under No. 10238..... 2.50
2874. **CLAMP, Test Tube**, of wood, improved form with steel spring..... .12
2880. **CLAMP, Test Tube, Stoddard's**, of brass spring wire. Length, $4\frac{3}{4}$ inches..... .12
- Note.**—For a very convenient arrangement for supporting Stoddard's Test Tube Clamp, see Nos. 2918-2922 on next page.
- 2882B. **CLAMP, Tubing, Cut-off**, of brass, nickel-plated. For tubing up to $\frac{5}{16}$ inch. 10% discount in lots of 12..... each .70
2884. **CLAMPS, Tubing, Mohr's Pinchcock**, of spring wire, nickel-plated.
- | | | |
|-------------------------------|----------------|----------------|
| No. | A | C |
| Total length, inches..... | $2\frac{1}{2}$ | $3\frac{1}{2}$ |
| For tubing up to, inches..... | $\frac{5}{16}$ | $\frac{1}{2}$ |
| Each | .12 | .18 |
2886. **CLAMP, Tubing, Mohr's Pinchcock**, of rectangular wire, giving a flat bearing surface on the tubing 3 mm wide, insuring close contact and safeguarding the tubing. Made of stiff spring brass, white-plated, with flat finger grips. Length, $2\frac{1}{2}$ inches; for tubing up to $\frac{3}{8}$ inch..... .15
2888. **CLAMP, Tubing, Spring Pinchcock, Day's (Patented)**. Can be placed on or removed from rubber tubing without disconnecting apparatus. The most serviceable pinchcock made. Constructed of strong spring wire, white-plated. Length, $2\frac{5}{8}$ inches; for tubing up to $\frac{3}{8}$ inch..... .15
- Note.**—10% discount in lots of 12, 25% discount in lots of 144 from all prices on this page.



2890. **CLAMPS, Tubing, Screw Compressor**, new form, of brass, nickel-plated; a combination of Hofmann's and the old form; can be placed upon rubber tubing without disconnecting apparatus.
 No. A B
 For tubing up to, inches..... $\frac{5}{16}$ $\frac{1}{2}$
 Each \$0.20 .25
2894. **CLAMP, Tubing, Bunsen's Screw Compressor**, of brass, nickel-plated, for heavy rubber tubing.
 Size, $\frac{3}{4}$ by $1\frac{1}{2}$ inches..... .40
2896. **CLAMPS, Tubing, Hofmann's improved form**, nickel-plated with open jaw.
 No. A B
 For tubing up to, inches..... $\frac{1}{2}$ $\frac{3}{4}$
 Each20 .30
2898. **CLAMPS, Universal**, with swivel jaws adapting themselves to irregular shapes; with check nut enabling object to be held at any angle. For use with Clamp Holder No. 2914.
 No. A B
 For tubes up to, inches..... 2 3
 Total length, inches..... 8 10
 Each60 .80
2900. **CLAMPS, Universal**, same as No. 2898, with jaws rubber covered.
 No. A B
 Each70 .90
2902. **CLAMP, Watch Glass**, of brass, nickel-plated, for watch glasses up to $2\frac{1}{2}$ inches in diameter .12
2906. **CLAMP**, with brass hook for supporting thermometers and other apparatus; with screw for attaching to support rods..... .85
2914. **CLAMP HOLDER**, of iron with brass screws, for fastening clamps to support rods up to $\frac{9}{16}$ inch in diameter30
2916. **CLAMP HOLDER**, same as No. 2914, with swivel, for attaching clamps at any angle.... .70
2917. **CLAMP HOLDER, Cenco friction type**, for use in holding clamps No. 2862, 2864, 2898, Rings No. 11502, or any other apparatus with a 10 mm attachment rod on a No. 13036B or 13038B Support. This is an application of a device first developed for laboratory use in our own shop. Either clamp is instantly released by pressing its two ends together and take hold firmly when the pressure is relieved without shifting its position. A time and trouble saving mechanism requiring only one hand to shift its position on the support rod..... 1.00
2918. **CLAMP HOLDER, Stoddard's**, an ingenious device for rigidly holding Stoddard Wire Test Tube Holder No. 2880 in any position. Provides for vertical and horizontal adjustment to any angle, and will adapt itself to a great many uses in the laboratory. Clamp holder with right angle clamp, but without Test Tube Holder or Base and Rod..... .50
2919. **CLAMP HOLDER** only of No. 2918..... .20
2920. **RIGHT ANGLE CLAMP** only of No. 2918. Has one $\frac{7}{32}$ -inch hole and one $\frac{1}{4}$ -inch hole.. .30
2922. **BASE AND ROD** for use with No. 2918 as shown in illustration. Base is heavy, and stable even with excessive load; rod is $15 \times \frac{7}{32}$ inches..... .60
- Note.—10% discount in lots of 12, 25% discount in lots of 144 from all prices on this page.



CLAMPS, GENERAL LABORATORY

The clamps listed in this section differ from the usual chemical laboratory clamps in that they are carefully machined to secure perfect alignment of apparatus with which they are used. All V's are accurately milled, holes are carefully reamed and faces are smoothly planed. They should be selected whenever it is essential to have apparatus assembled with an accurate arrangement of parts.

2930B. CLAMPS, Adjustable, steel. These clamps are so constructed that they can be quickly adjusted and will lock themselves the moment the pressure is applied to the screw. The bar is $3\frac{1}{4}$ inches from the center of screw. Maximum opening, 10 inches. A very desirable clamp for light or medium work \$2.10

F211. COLLARS, with set screw, allowing a clamped rod to rotate freely, and at the same time preventing motion along the axis. The two smaller sizes are of brass, nickel-plated; the others of iron, neatly japanned.

No.	A	B	C	D
For rods of diameter, mm.....	10	13	19	30
Each	.70	.75	.50	1.80

F213. HOOK COLLARS, with set screw, of substantial construction. The many uses to which such a piece may be put will readily be seen. The two smaller sizes are of brass, nickel-plated; and the other of cast iron, neatly japanned.

No.	A	B	C
For rods of diameter, mm.....	10	13	19
Each	.80	.90	.70

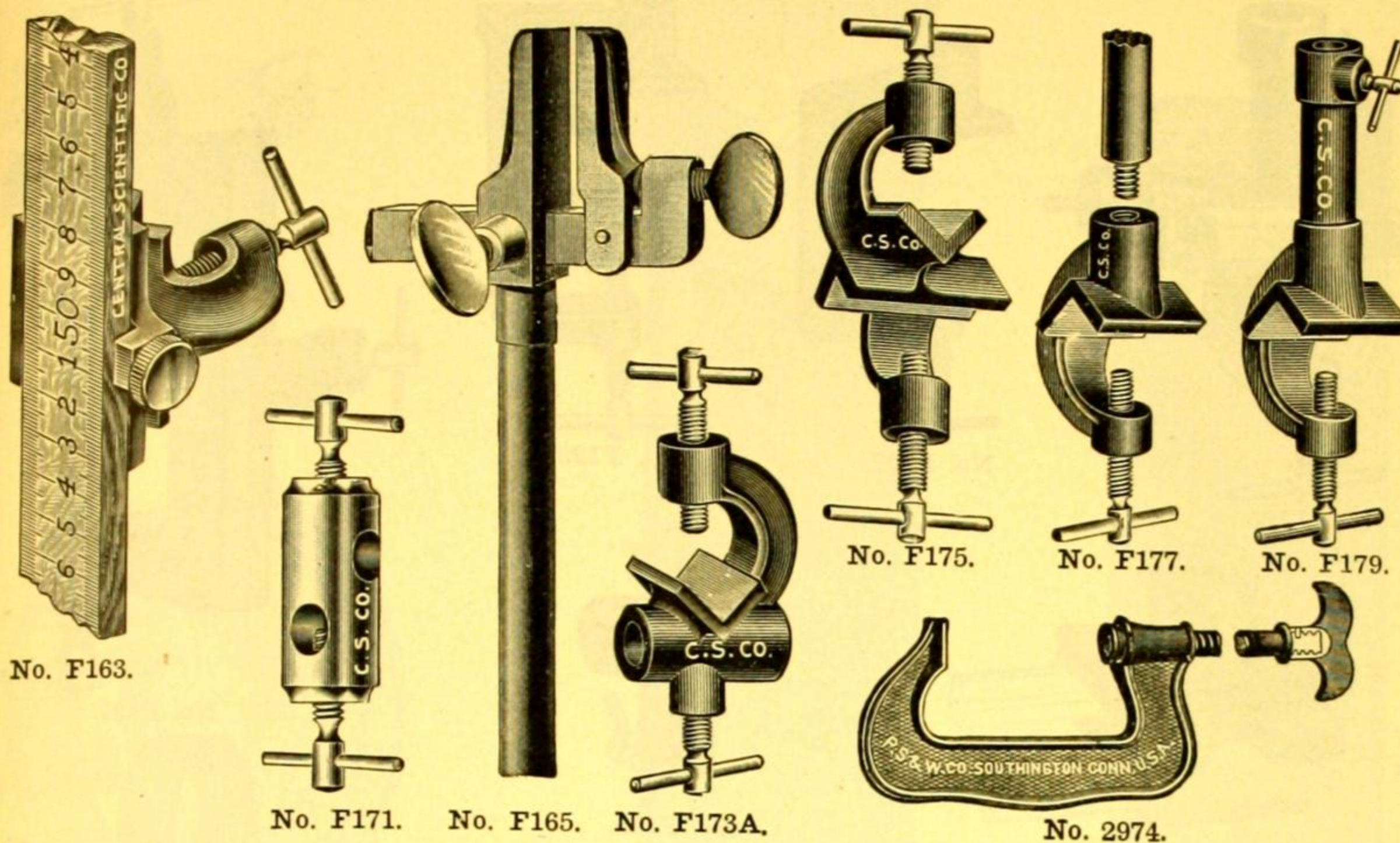
F153. CLAMPS, Extension, for holding two rods parallel to each other. (The illustration shows the clamp in use with two rods and an iron table top.)

No.	A	B	C
For rods of diameter, mm.....	10	13	19
Each	.90	1.15	1.75

2940. CLAMPS, Hand Screw, wood, with saw cut threads on screws.

No.	B	D
Length of jaws, inches.....	7	10
Opening, inches.....	3	$5\frac{1}{2}$
Each	.70	1.00

F155. CLAMP, Extension, for holding two rods parallel to each other. By using this clamp it is possible to fasten two rods parallel to each other without slipping the clamp over the end of the rods, as was necessary in the old form. For use with rods of from 10 to 19 mm diameter. 1.35



F163. **CLAMP, Meter Stick.** A convenient device for holding the ordinary meter stick in position on a rod, with V opening for clamping it to any rod from 10 to 19 mm in diameter. The meter stick is held firmly in place parallel to the rod by a thumb screw..... \$0.70

F165. **CLAMPS, Parallel-Jawed,** of brass, nickel-plated, for holding square objects, mirrors, scales, screens, etc. Maximum opening of jaw, 4 cm. Rod 10 mm in diameter.

No.	A	B
Rod, length, cm.....	10	20
Each	2.80	2.85

F171. **CLAMP, Right Angle,** of brass, nickel-plated. To hold two 10 mm rods accurately at right angles to each other..... .75

F173. **CLAMP, Right Angle,** of iron, neatly japanned. Sizes B and C have zero indicator for optical bench accessories.

No.	A	B	C	D
V opening for rods of diameter, mm.....	13	19	19	30
Hole for rods of diameter, mm.....	10	13	6	19
Each	.85	1.00	1.25	2.00

F175. **CLAMP, Right Angle,** of iron, neatly japanned, with two V openings at right angles.

No.	A	B
V openings for rods of diameter, mm.....	13	19
Each	.90	1.00

Note:—For less expensive right angle clamps, see No. 2914 Clamp Holder.

F177. **CLAMP, Right Angle.** One 19 mm V opening. Tapped $\frac{1}{4}$ -20 to receive 10 mm rod..... 1.00

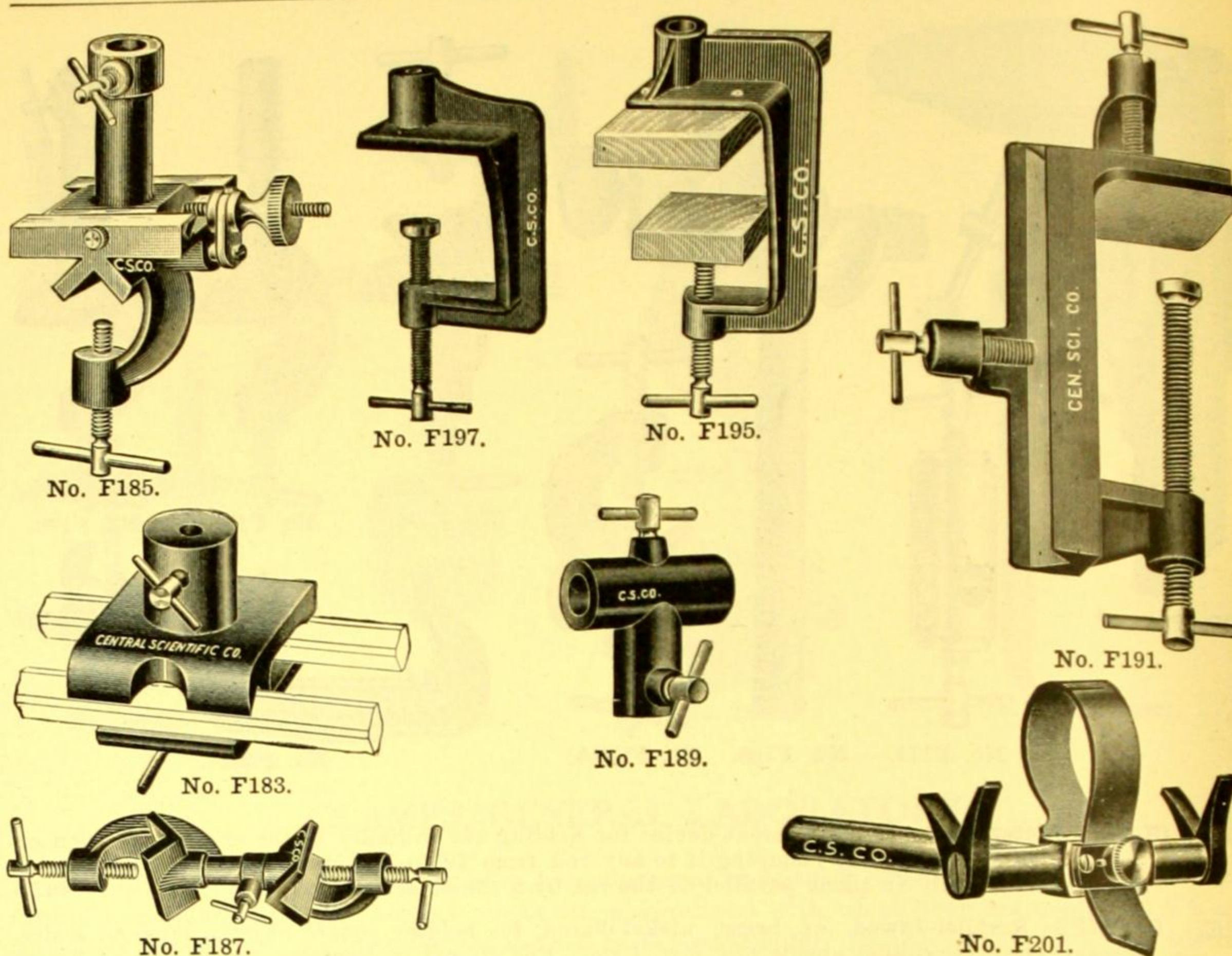
F179. **CLAMP, Right Angle,** for lens holders, telescope supports, pulleys, etc., with zero indicator for photometer and optical bench accessories. Carefully made so that the rod will be held perpendicular to the V. The V opening is for rods 19 mm in diameter.

No.	A	B
Hole for rods of diameter, mm.....	10	13
Each	1.00	1.70

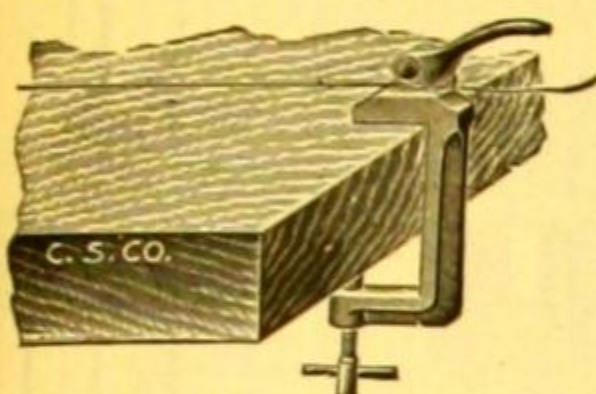
F180. **CLAMP, Right Angle,** same as No. F179A, with addition of a spring so that it can be moved along the rod without loosening the set screw. Convenient for carrying photometer box. 2.75

2974. **CLAMPS, Standard,** made of malleable iron, and provided with ball and socket swivel cap on screw.

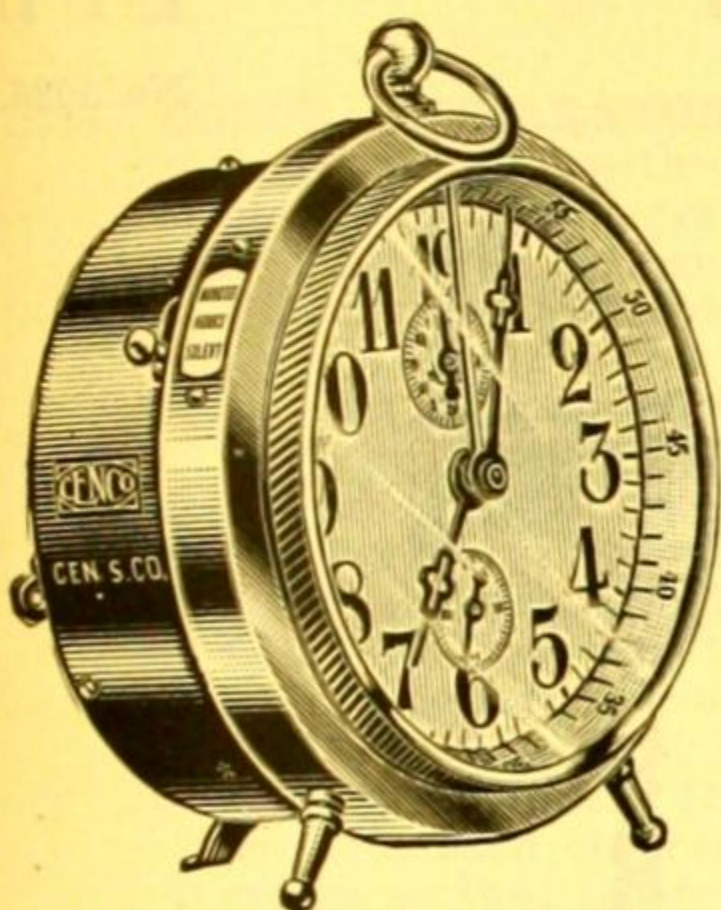
No.	A	B	C
Opening, inches.....	3	4	6
Each	.45	.60	1.00



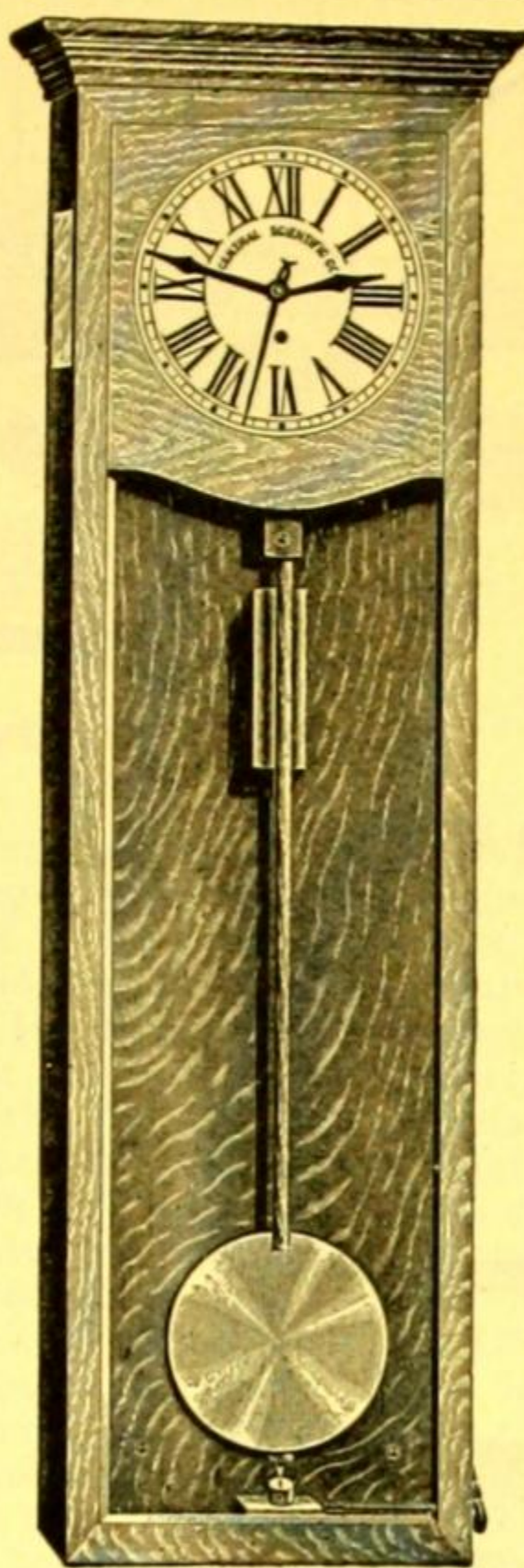
- F183. **CLAMP, Support, Bridge Form.** For use with double rod optical bench or photometer, made up of No. F303 End Supports and a pair of 19 mm square rods. Is easily clamped to the rod by a slight movement of the handle seen in the illustration. Provided with an index line or zero indicator in the same plane with the vertical hole, which is 10 mm in diameter..... \$5.25
- F185. **CLAMP, Support, Screw Adjustment.** For same uses as No. F179 Right Angle Clamp, but designed to give a very fine adjustment in a plane perpendicular to the V. Provided with zero indicator. Range of adjusting screw, over 25 mm; V opening, 19 mm; hole, 10 mm... 6.50
- F187. **CLAMP, Swivel.** Very useful for holding pulleys, mirrors and lens supports where different angular directions are desired. Two 19 mm V openings, which can be clamped at any angle to each other in parallel planes..... 1.80
For less expensive **CLAMP**, with swivel, see No. 2916 Clamp Holder.
- F189. **CLAMPS, T, for holding two round rods at right angles to each other in the same plane.**
- | No. | A | B |
|-------------------------------|------|------|
| For rods of diameter, mm..... | 13 | 19 |
| Each | 1.25 | 2.00 |
- F191. **CLAMP, Table, of iron, for a table top 8 cm thick or less, with accurately milled V's at right angles to each other.** To be attached to the edge of the table for holding 10 to 19 mm round or square rods, either horizontally or vertically. The broad flange is carefully milled and insures stability. The T-screw is swiveled for protection of the table..... 2.80
- F195. **CLAMP, Table, wooden jaws, for a table top 8.5 cm thick or less.** Designed for use where there is danger of injury to the table top. Upper jaw, 8x18 cm; lower jaw, 8x10 cm. The large surface of jaws gives increased stability. The lower jaw is swiveled. Tapped $\frac{3}{4}$ -12 to receive 19 mm rod..... 3.00
- F197. **CLAMP, Table.** Similar to No. F195, but without the wooden jaws. The flange at the top is broad so that injury to the table top is prevented. Tapped $\frac{3}{8}$ -16 to receive 13 mm rod..... .85
- F201. **CLAMP, Telescope.** Made of brass, for holding telescopes from 2 to 5 cm in diameter. The telescope is held in place by a leather strap and is therefore not liable to injury as is the case when metal clamps are used. A No. F133 Support Rod, 20 cm in length, is included, which may be placed either as shown in the illustration or in a position at right angles to this. The clamp is also tapped to receive a No. F131 Support Rod for carrying a scale..... 4.00



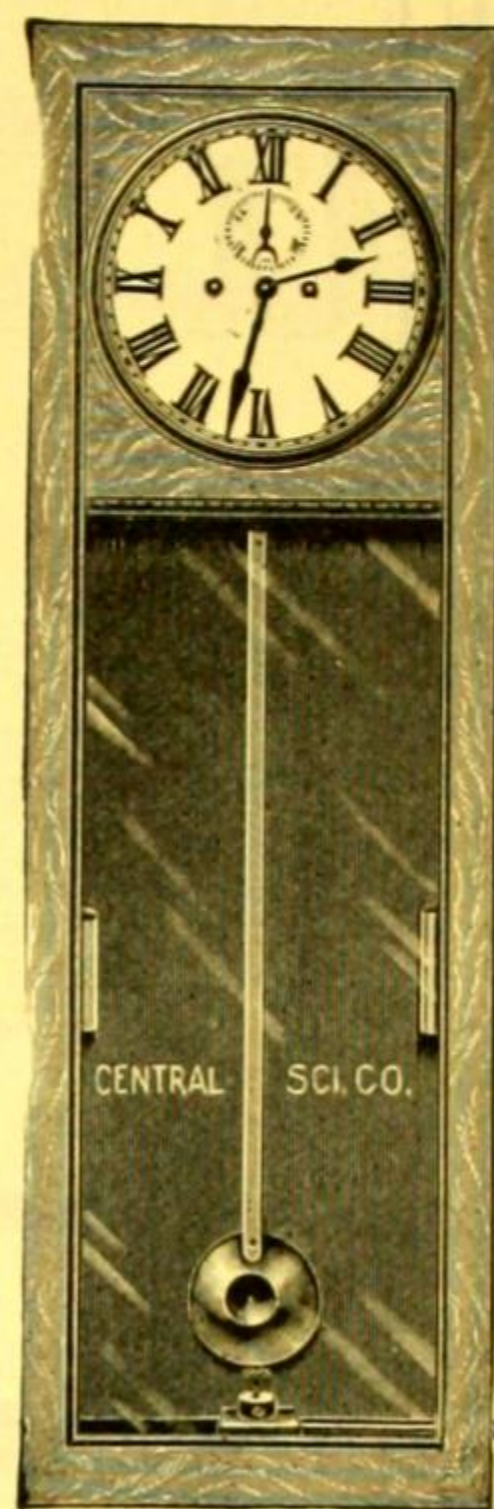
No. F203.



No. 3000.



No. 3002.



No. 3004.

F203. CLAMP, Stone's Tension, modified form, for use in experiments where it is desired to maintain a strain on a wire or cord and enable an individual operator to readily adjust the tension without the co-operation of a second person.

This clamp is substantially made of cast iron and neatly finished. Will fit any table or board 7 centimeters thick or less. Wires, cords, etc., are securely clamped by an eccentric lever, as shown in the illustration. \$0.90

3000. CLOCK, Interval, for sounding an alarm at the expiration of any given interval of time from 20 seconds to 12 hours. This clock has a number of special features not found in similar devices previously offered:

- (1) It is a reliable time keeping clock with the usual hour, minute and second hands.
- (2) It will produce either a soft "buzz" or a loud ring.
- (3) It may be set to sound a steady or intermittent alarm as desired.
- (4) The interval desired, if less than one hour, is obtained by turning the knurled ring which carries the glass face until the proper figure coincides with the minute hand. When the minute hand has reached the white index hand at zero, the alarm will sound.
- (5) Intervals of more than one hour are obtained by setting the small hour alarm hand at the time desired as in any alarm clock, then turning the knurled ring until the white index hand is at the exact number of minutes beyond the hour. The switch knob is then moved from the "minute" to the "hour" position.
- (6) The alarm is instantly silenced by moving the switch knob to the "silent" position.

As described above with directions for use. 7.00

Note:—For an **Automatic Time Switch** for disconnecting electrically operated apparatus at the expiration of any interval, see No. 13810.

3002. CLOCK, Laboratory. This is the best clock we can furnish, adapted to the needs of the average laboratory. It is an eight-day Waltham movement, weight-driven clock, and we guarantee it to be a reliable timekeeper.

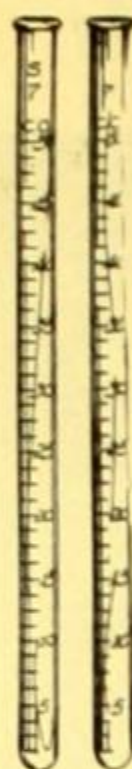
The dial is 12 inches in diameter with seconds divisions. It is provided with hour and minute hands and a full sweep seconds hand for timing laboratory experiments.

The pendulum is full seconds length, and provided with an adjustable platinum contact. A mercury well of improved construction, adjustable from the outside of the case, is mounted in correct position.

The clock is completely enclosed in a polished oak case, with glass front and glass covered opening in the sides opposite the works, and binding posts on the outside for attaching battery and sounder. 165.00

3004. CLOCK, Laboratory. An eight-day clock with good movement, driven by two weights. The dial is 12 inches in diameter and the pendulum beats seconds. The clock is provided with mercury contact adjustable from the outside of the case, and with binding posts for electrical connections. Complete in polished oak case with glass door. 80.00

3008. CLOTH, Cotton, Turkey Red, used to show bleaching effect of chlorine. per yard .40



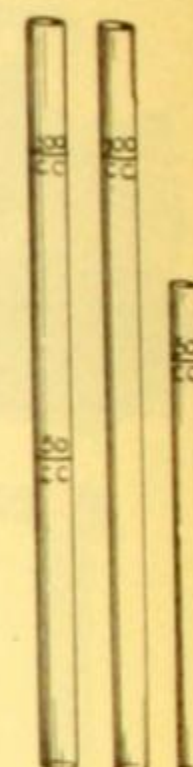
No. 3016.



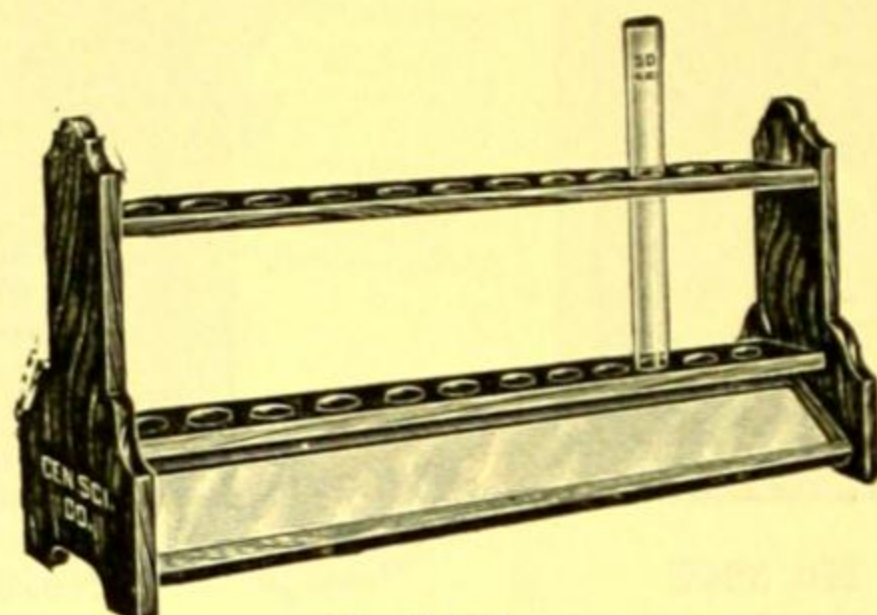
No. 3020.



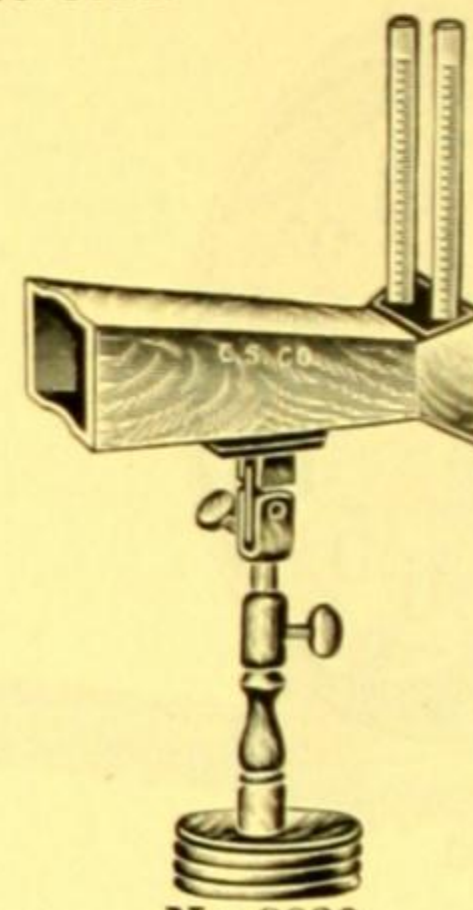
No. 3024.



No. 3026.



No. 3029.



No. 3030.

COLOR COMPARISON TUBES

COLOR COMPARISON TUBES, Eggertz, for the estimation of carbon and manganese in steel by the colorimetric method.

No.	A	B
Capacity, cc.	30	50
Graduated in, cc.	$\frac{1}{10}$	$\frac{1}{10}$
3016. Per set of two.	\$2.50	2.70
3017. Per set of four.	5.50	6.00

COLOR COMPARISON TUBES, Julian's, same as No. 3016, but with bent ends to permit mixing of contents without using a stopper. The lower portion of the tube is ungraduated.

No.	A	B
Graduated from, cc.	5 to 30	10 to 50
Graduated in, cc.	$\frac{1}{10}$	$\frac{1}{10}$
3020. Per set of two.	3.00	3.25
3021. Per set of four.	6.60	7.00

COLOR COMPARISON TUBES, Nessler, usual form for ammonia test, of clear colorless glass with polished bottoms.

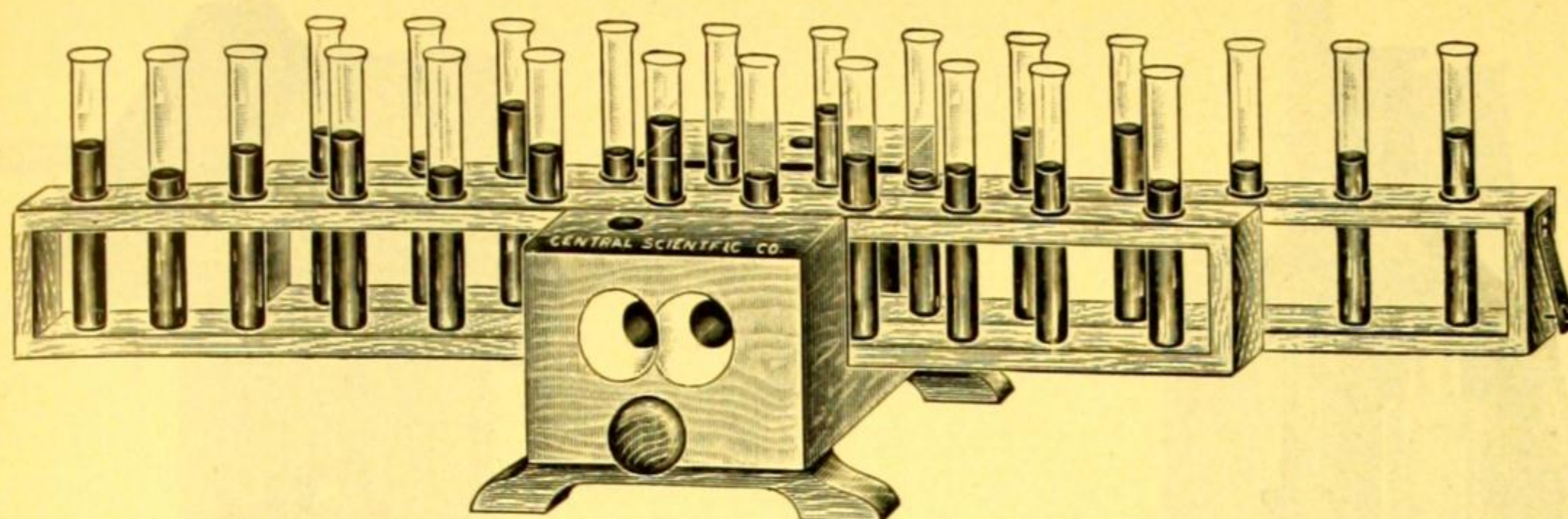
No.	A	B	C
Graduated at, cc.	50	100	50 & 100
Each	.70	.90	1.00

COLOR COMPARISON TUBES, Nessler, American Public Health Association Standard. Tall form of clear glass with polished bottoms. Graduations of sets agree within 6 mm and are about 210 mm on 50 cc tube and 325 mm on the 100 cc tube from the bottom. (See Standard Methods of Water Analysis for 1920, page 16.) In sets to agree.

No.	A	B	C
Graduated at, cc.	50	100	50 & 100
3026. Each	.70	1.00	1.20
3027. Per set of six.	4.50	6.70	8.50
3028. Per set of twelve.	9.50	14.00	18.70

3029. STAND for Nessler Tubes, of wood, stained black, with white glass reflector set at angle to reflect light upward through tubes. For twelve tall form 50 cc tubes. Without tubes..... 3.25

3030. CAMERA for use with color comparison tubes. Improved form, so constructed that the shadow of the edge of the box cannot be thrown on the tubes; with blue and ground glass.... 15.00



No. 3036.

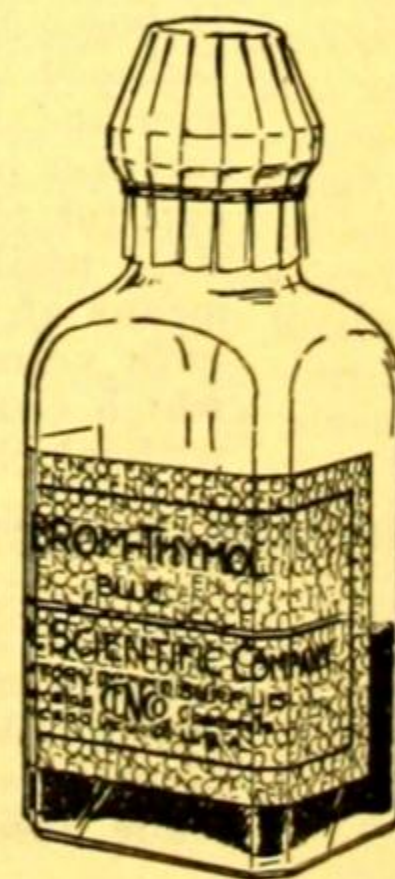
3036. **COLOR COMPARATOR, Cooledge**, developed from the original design by Prof. L. H. Cooledge in co-operation with our technical department, for the convenient comparison of a series of unknowns with a graduated series of liquid color standards, as used in the colorimetric determination of hydrogen ion concentrations with Clark and Lubs indicators. The arrangement of the standard and unknown tubes at the time of the comparison is the same as in the comparator described by Hurwitz, Meyer and Ostenberg (Bulletin, Johns Hopkins Hospital, 1916, Vol. XXVII, page 16) with holes for the Walpole (Biochemistry Journal, 1910, Vol. V, page 207) combination for use when dealing with turbid or highly colored solutions where color comparison is impossible without special equipment. The comparator consists essentially of two hardwood test tube racks, mounted in a track in a hardwood support block which contains the operating devices, the observation windows and openings for the Walpole combination. The test tube racks are 24 inches long and contain 12 holes each $\frac{7}{8}$ inch in diameter for holding test tubes containing the standard and unknown liquids. As the rear rack is used for the standards, it has a cord arrangement with which it may be rapidly moved to locate the correct standard. The front rack holds the unknowns, which are moved the distance of only one tube each observation by means of a hardwood knob. The racks are provided with a catch system so that the tubes are always brought exactly opposite their proper observation windows. The Comparator may be directly illuminated by an electric lamp at the rear of the device, or by light reflected from a white object appropriately placed. Complete as described, without tubes or reagents..... \$10.00

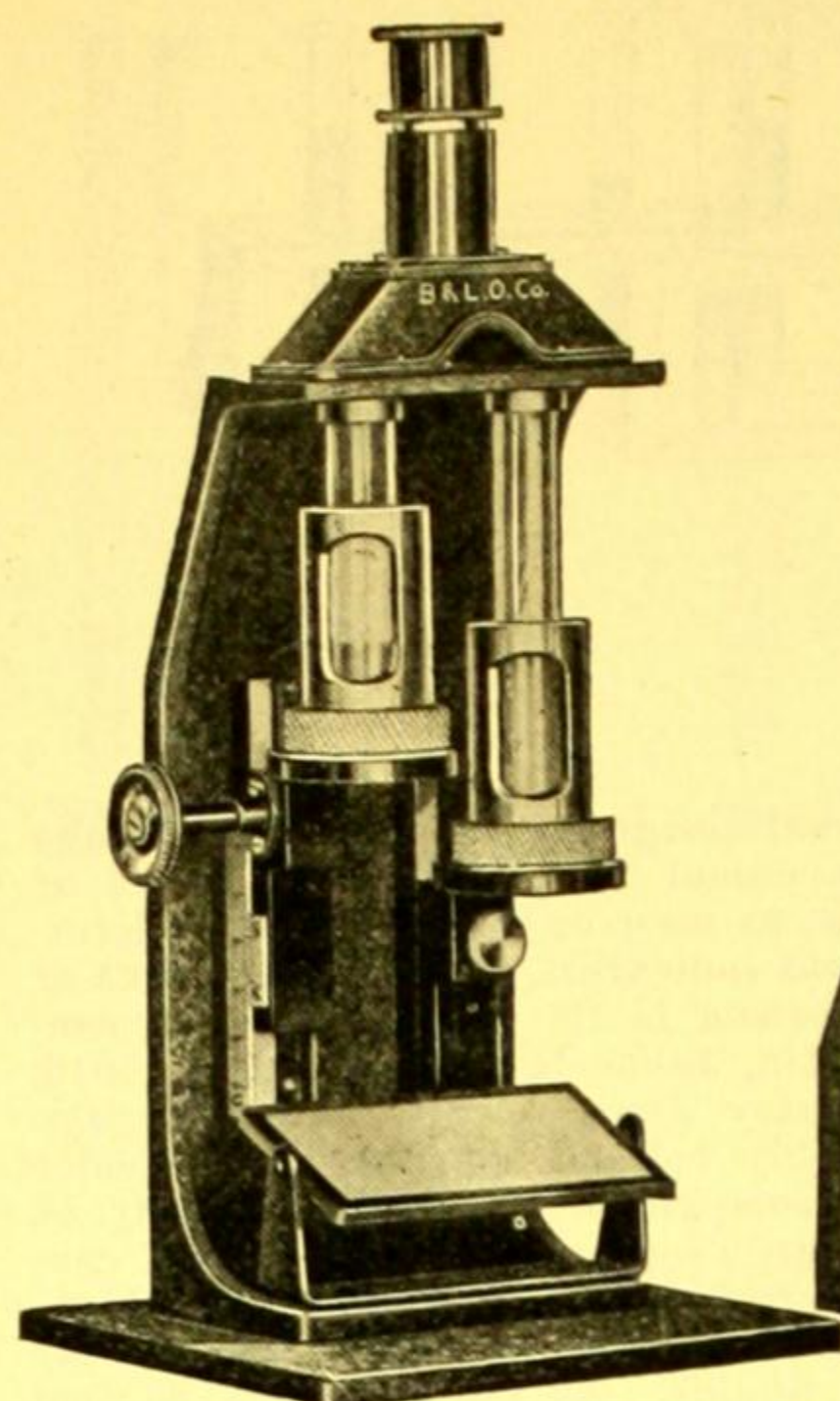
H-ION INDICATORS, Clark and Lubs, suggested for colorimetric determinations of hydrogen ion concentration as the result of an extensive series of comparisons between colorimetric and electrometric measurements, made for the most part upon solutions of interest to bacteriologists. This series is made up largely of the brilliant and more reliable sulfon phthaleins, but contains the still indispensable, but not very stable methyl red. In the course of their investigations, Clark and Lubs found Ortho Cresol Phthalein as reliable as Phenol Phthalein and more brilliant, with a color better adapted to titrations in artificial light. Brom Cresol Purple covers practically the same range as Litmus, but is more brilliant and reliable. The indicators of this series are relatively unaffected by conditions other than hydrogen ion concentration, such as the presence of salt and protein. For the preparation of stock solutions from these dry powders, dissolve 1/10 gram of the dry powder by grinding in an agate mortar with the indicated quantity of N/20 NaOH. When the solution is complete, dilute to 25 cc. When made up in this manner, there is obtained in each case a 0.4 per cent. solution of the dye. For use in testing 10 cc quantities of unknown, five drops of indicator should be used. In this case Thymol Blue, Brom Thymol Blue, Brom Phenol Blue and Brom Cresol Purple should be diluted to 0.04 per cent. solution and Cresol Red, Phenol Red and Methyl Red to 0.02 per cent. solution. Ortho Cresol Phthalein and Phenol Phthalein are used in a 0.02 per cent. solution in 95 per cent. alcohol. (See The Determination of Hydrogen Ions, W. Mansfield Clark, 1920.)

Indicator	pH Range	Molecular Weight	cc N/20 NaOH per 1/10 gm	Per 1/10 gm bottle	Per 1 gm bottle
Thymol Blue (Acid) ..	1.2-2.8	466.30	4.3	.30	2.00
Brom Phenol Blue ..	2.8-4.6	669.82	3.0	.30	2.00
Methyl Red	4.4-6.0	269.12	7.4	.30	.60
Brom Cresol Purple ..	5.2-6.8	540.01	3.7	.30	2.00
Brom Thymol Blue ..	6.0-7.6	642.12	3.2	.30	2.00
Phenol Red	6.8-8.4	354.17	5.7	.30	2.00
Cresol Red	7.2-8.8	382.17	5.3	.30	2.00
Thymol Blue (Alk) ..	8.0-9.6	466.30	4.3	.30	2.00
Phenol Phthalein ...	8.4-9.2	318.22	..	.25	.50
Cresol Phthalein	8.2-9.2	348.27	..	.30	1.50

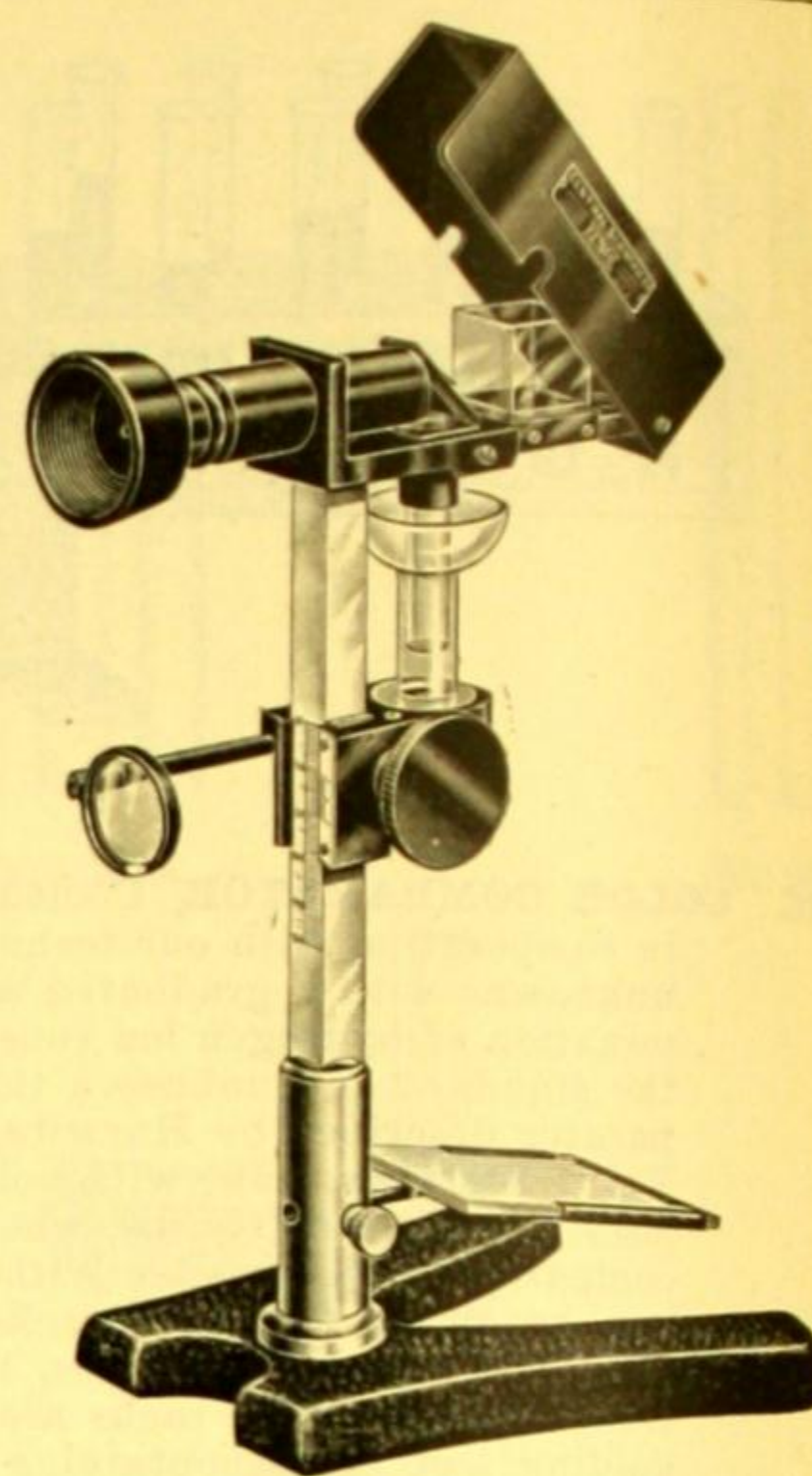
SODIUM HYDROXIDE SOLUTION, N/20 NaOH, for use in preparing solutions of Clark and Lubs indicators, in sealed, glass stoppered bottles.

Per 500 cc g. s. b.	1.25
Per 1000 cc g. s. b.	2.00





No. 3038.



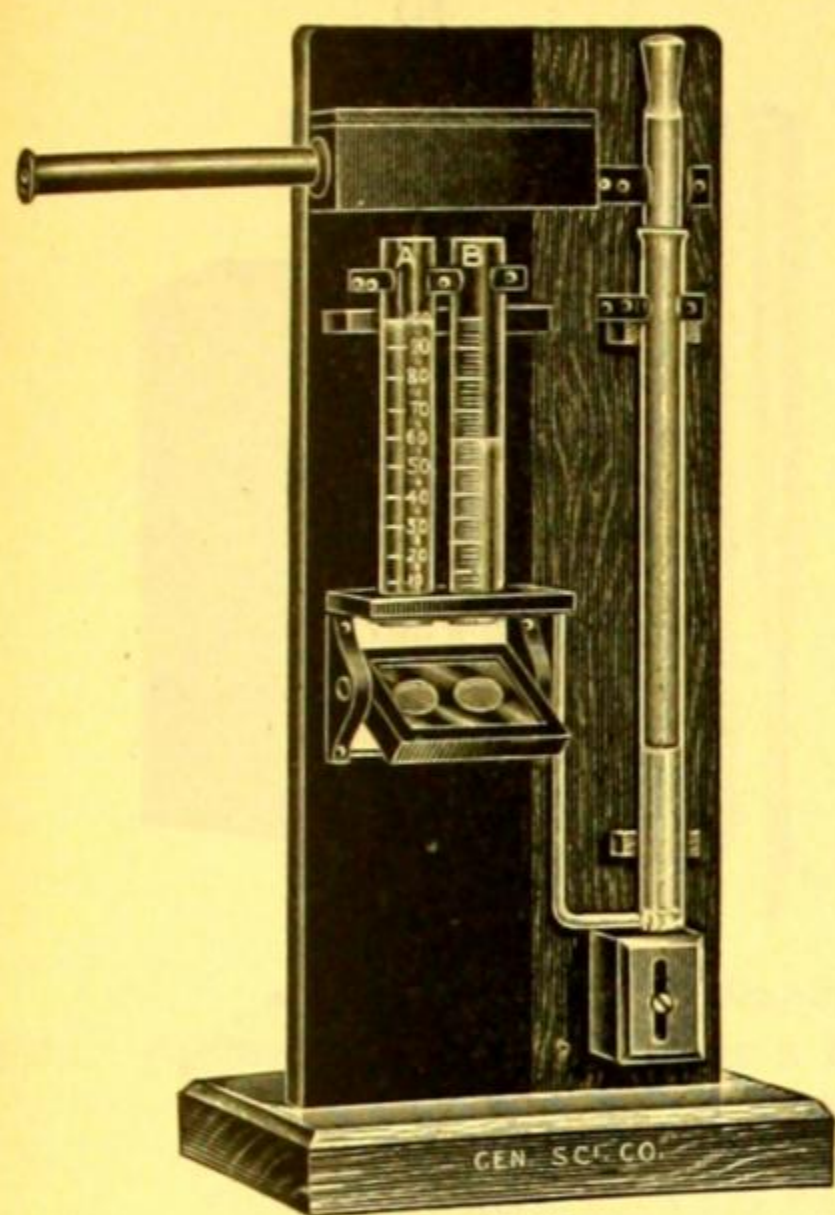
No. 3039.

STANDARDIZED BUFFER SOLUTIONS, Clark and Lubs, One-fifth Molar (M/5) Solution. For colorimetric comparisons of hydrogen ion concentration, the standards, against which the unknowns are compared, must be of such well defined compositions that they can be accurately reproduced, and with pH values accurately defined by hydrogen electrode measurements. These solutions are called buffer solutions and generally consist of mixtures of some acid and its alkali salt. Clark and Lubs have selected a set of standards which they believe to be somewhat more convenient than any previously selected series. A full discussion of these mixtures, the methods used in determining their pH values and the potential measurements is to be found in the original paper. (See Journal of Biological Chemistry, 1916, Vol. XXV, No. 3, page 479.) The following buffer solutions are supplied in sterile, sealed, glass stoppered bottles.

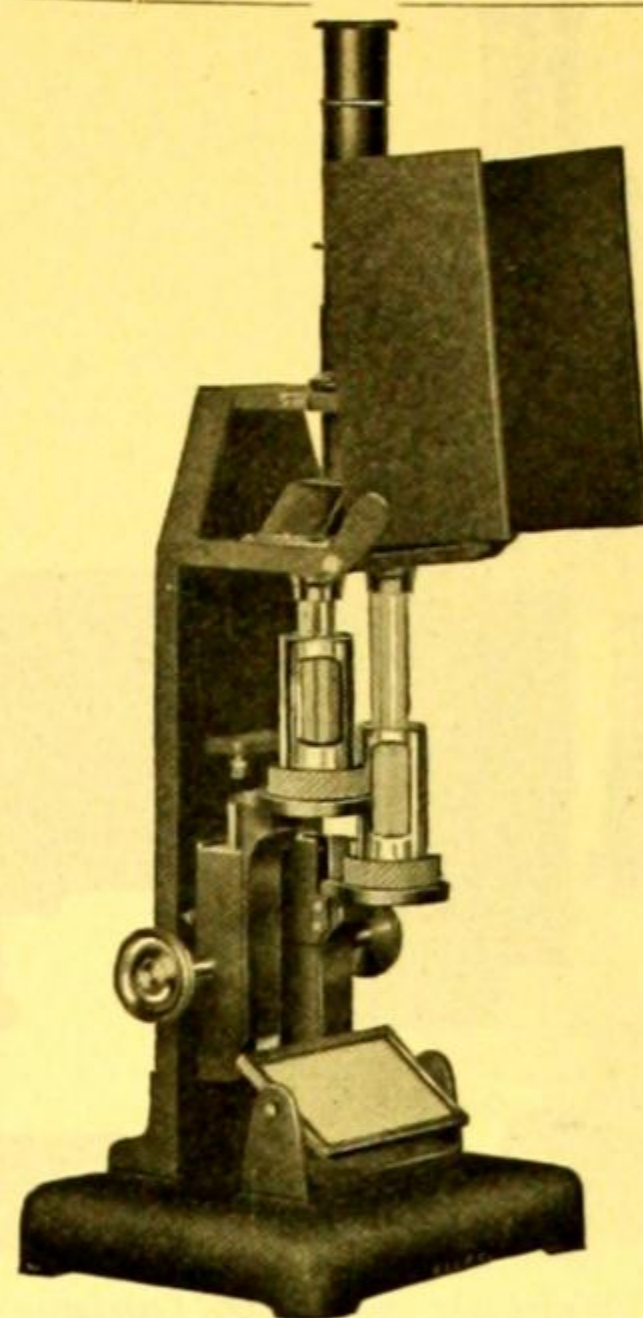
Solution	For Mixtures of pH range	Per 500 cc g. s. bottle	Per 1000 cc g.s. bottle
Potassium Chloride	1.2-2.2	\$3.75	5.25
Acid Potassium Phthalate.....	2.2-6.2	4.20	5.75
Acid Potassium Phosphate.....	5.8-8.0	3.80	5.40
Boric Acid Potassium Chloride.....	7.8-10.0	4.00	5.50
Sodium Hydroxide (CO ₂ free).....	.....	4.00	5.00
Hydrochloric Acid .....	.....	3.25	4.50
Boric Acid .....	.....	3.25	4.50
Disodium Phosphate .....	.....	3.75	5.25

3038. **COLORIMETER, Biological**, designed to meet the demand for a high grade colorimeter of the Duboseq type at a moderate price. The optical principle is the same as in the standard Duboseq instrument. The plungers are made of selected optical glass of high light transmission and freedom from color, and are accurately ground and polished, with top and bottom surfaces parallel. The cups have plano-parallel bottoms which are removable. The left hand cup for the standard solution is moved up and down by hand, and may be fixed at any desired position by means of a thumb screw. The right hand cup for the unknown is moved by means of a rack-and-pinion. The two scales are calibrated in millimeters, and are provided with verniers by means of which readings may be made to 1/10 mm. The maximum depth which can be measured is 40 mm. Colorimeter, as described complete with light shield, but without case 60.00

3039. **COLORIMETER, Bock-Benedict**, a simple instrument for medical work employing a pair of mirrors to juxtapose the fields to be compared. The standard color solution is placed in a rectangular glass cell between the mirrors, while the unknown is placed in a cylindrical cup capable of being moved through 30 mm by means of a rack-and-pinion. The rectangular cells may be placed either with or across the axis of the system, thus changing the thickness of the layer of standard solution. The cylindrical cups are of small capacity enabling readings to be made accurately with as little as 2 cc of unknown. By means of a magnifier and vernier



No. 3040.



No. 3044.

COLORIMETER, Bock-Benedict, Continued.

mounted on the movable cup support readings may be made to 1/10 mm. (See Journal of Biological Chemistry, Vol. XXV, No. 2, for August, 1918, page 227.) Complete instrument with plunger, one cylindrical cup for unknown and one 15 by 10 mm cell for the standard, with directions for use

\$40.00

3039A. Cell, for No. 3039, rectangular glass for standard, 8 by 10 mm.....

2.30

3039B. Cell, for No. 3039, rectangular glass for standard, 15 by 20 mm.....

2.30

3039C. Cup, for No. 3039, cylindrical glass for unknown

1.15

3039D. Plunger, for No. 3039, cylindrical glass.....

1.15

3040. **COLORIMETER, Campbell-Hurley**, for all types of colorimetric comparisons where at least 100 cc of unknown is available. Especially useful in steel, water, oil, paint and varnish and general analytical laboratories, replacing the less accurate comparison cameras. A system of mirrors juxtaposes the fields of the unknown and standard, which appear, through the telescope, as a single field divided by a hair line. The shade of the right hand half of the field is that of the standard solution and is easily varied by manipulating the glass plunger in the reservoir attached to one tube. Complete as illustrated with standard cylinder graduated to 100 cc in 1 cc divisions, and with cylinder for unknown graduated to 100 cc in 10 cc divisions. (See Journal of the American Chemical Society, Vol. XXXIV, No. 7, for July, 1912).....

28.00

3041. **Graduated Cylinder**, only, for No. 3040, for unknown solution

1.50

3042. **Graduated Cylinder**, only, for No. 3040, with attached reservoir and glass plunger, for standard solution.

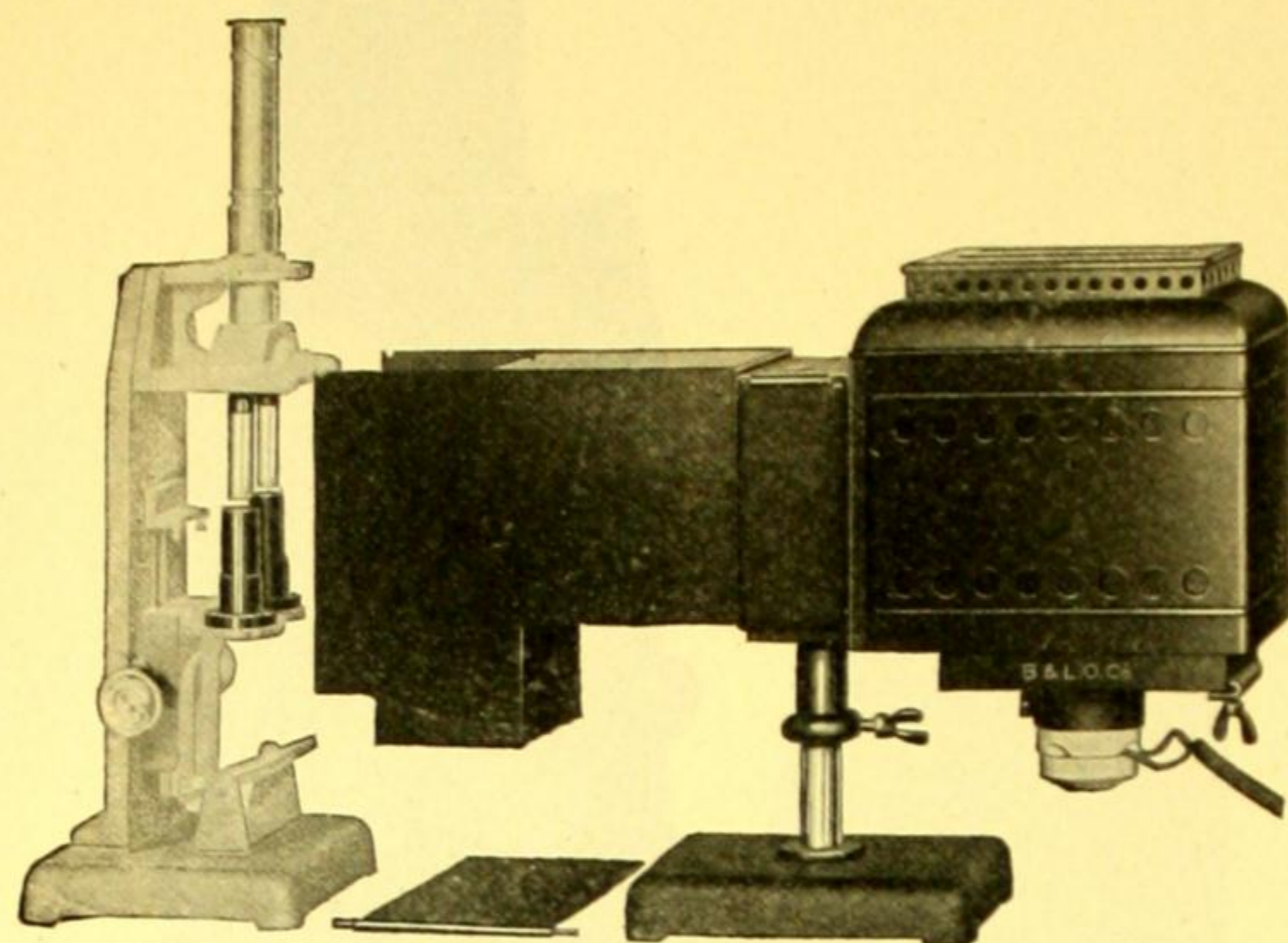
6.00

3044. **COLORIMETER, Duboscq, Bausch and Lomb**, improved design, for measuring the intensity of the coloration of any liquid, through which light may be transmitted, by direct comparison with a standard liquid. In the industries it finds widespread application in such work as the determination of titanium, manganese, carbon in steel, aluminum, bismuth, antimony, chromium, fluorine, copper, gold and many other substances. Since the work of Dr. Otto Folin on the determination of total nitrogen, non-protein nitrogen, urea, uric acid, creatine, creatinine, etc., in blood and urine, this type of colorimeter has become the standard for biological and medical use. The optical system, which is the essential part of the instrument, is of the highest quality, being made of the best optical glass of neutral tint, accurately ground and polished. The bottoms of the cups and the plunger ends are plano-parallel, permitting the two beams of light reflected from the mirror to pass through them and the liquid into the coincidence prism, without modification. The frame and base is made of heavy castings, so constructed as to provide for stability and permanent alignment of the optics. Both cups are raised and lowered by means of racks-and-pinions of precision type. Readings are made to 1/10 mm from the engraved millimeter scale on the back by means of verniers. Complete as described, in polished hardwood case, with directions and four pair of matched ray filters to permit modification in tint of liquids to be studied.

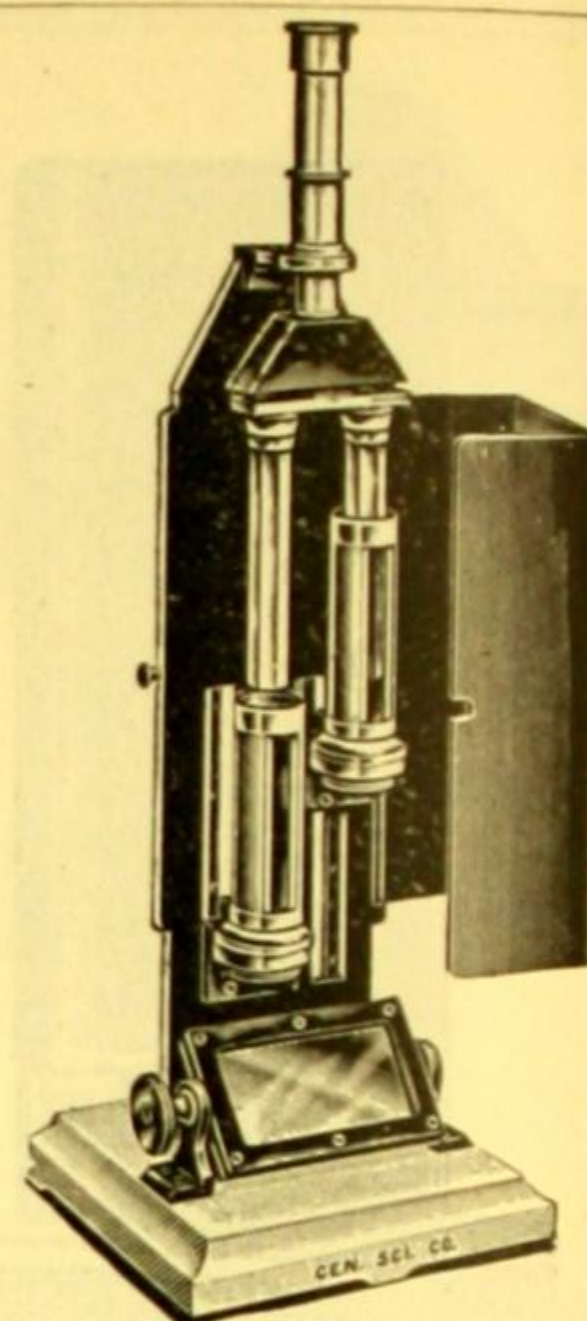
No.	A	B
Height of cups, cm.....	5	10
Each	125.00	165.00

3045. **Cups, glass, complete for No. 3044 colorimeters.**

No.	A	B
Height, cm	5	10
Each	5.50	8.00



No. 3046.



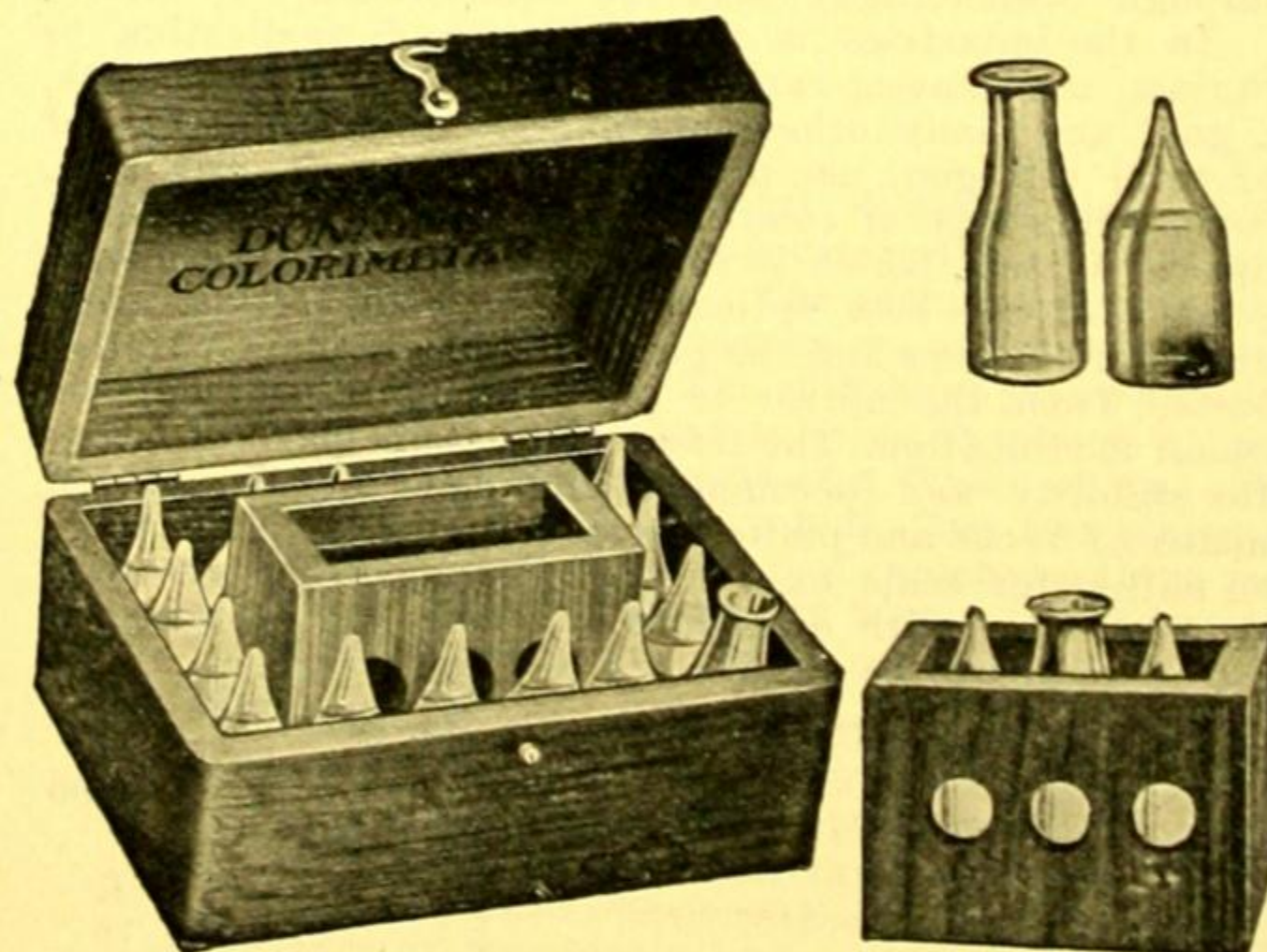
No. 3047.

3046. **NEPHELOMETER ATTACHMENT**, for use with No. 3044 Colorimeter in making quantitative determinations of substances in liquids by estimating the translucency possessed by certain concentrations when a cloudiness exists or can be brought about. The attachment consists of a 250 watt mazda lamp mounted in the focus of a pair of condensers, which project a beam of parallel rays of light horizontally into vials containing the liquid under examination; and which are inserted in the place of the glass plungers on the Duboscq colorimeter. Two tubular metal light shields replace the cups on the colorimeter and are raised and lowered by the rack-and-pinion in the same manner as the cups, thus screening and exposing definite depths of the liquid under examination to the light rays. The brightness of the field, judged through the observing microscope on the colorimeter, depends on the number of particles in suspension in the liquid, so that quantitative determinations of turbidity are obtained by matching the field of the unknown against the field of the standard.

No.	A	B
Height of vials, cm.	5	10
Each	\$75.00	90.00

3047. **COLORIMETER**, Duboscq, Original French, made in the factory of the successors of Jules Duboscq, who in 1854 first devised this type of colorimeter. This instrument is essentially the same as the No. 3044 Duboscq Colorimeter varying only in small mechanical details. It is used in exactly the same manner. Complete, with four pair of tinted ray filters and one pair of ground glasses.

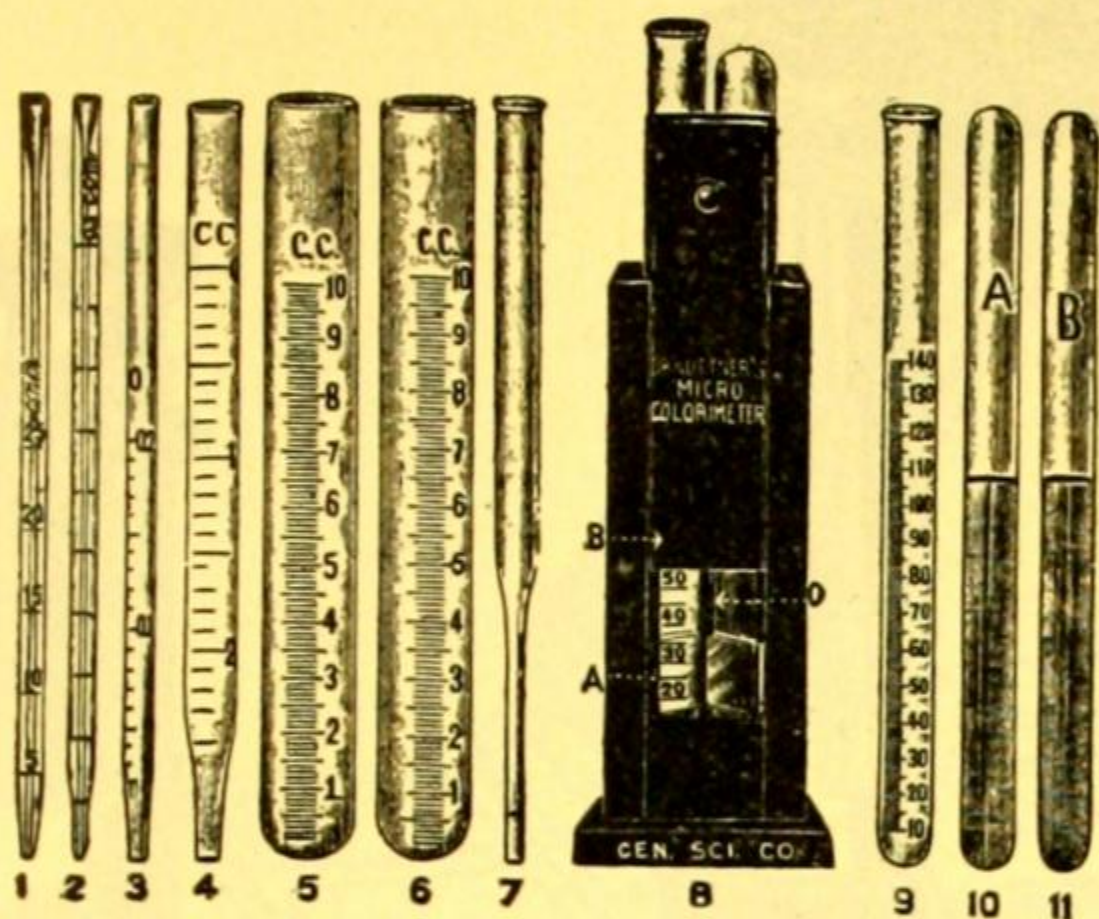
No.	A	B
Height of cups, cm.	5	10
Each	92.00	149.00



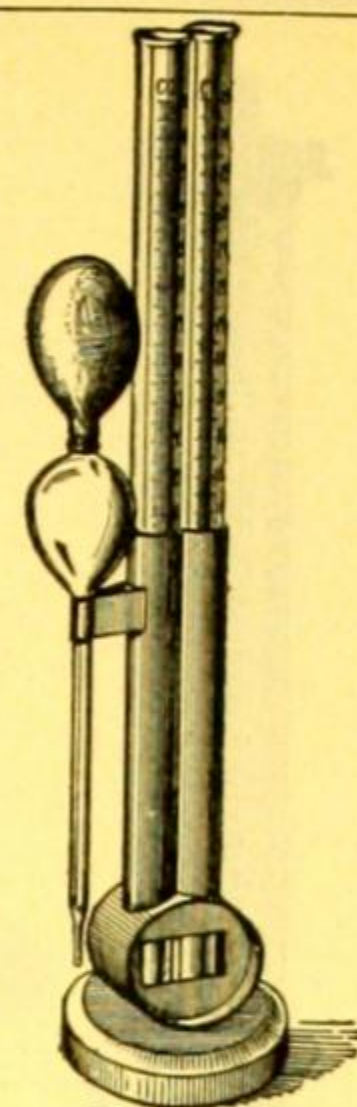
No. 3048.

3048. **COLORIMETER**, Dunning, for estimating the quantity of phenol-sulphone-phthalein excreted when applying the Rountree-Gerahty renal functional test. Complete with colorimeter box, empty ampoule, and 13 calibrated test ampoules varying in color, in polished wooden box, 2½ by 3½ by 5 inches. (See Journal of Pharmacology and Experimental Therapeutics, Vol. I, No. 6, for July, 1910, page 579; also the Journal of the American Medical Association, Vol. LVII, No. 10, page 811.) 6.50

3049. **PHENOL-SULPHONE-PHTHALEIN AMPOULES**, for use with No. 3048, containing sterile, biologically standardized solution of the mono-sodium salt, with strength of 8 mg to each cc; in box of 10 ampoulesper box 1.25



No. 3052.

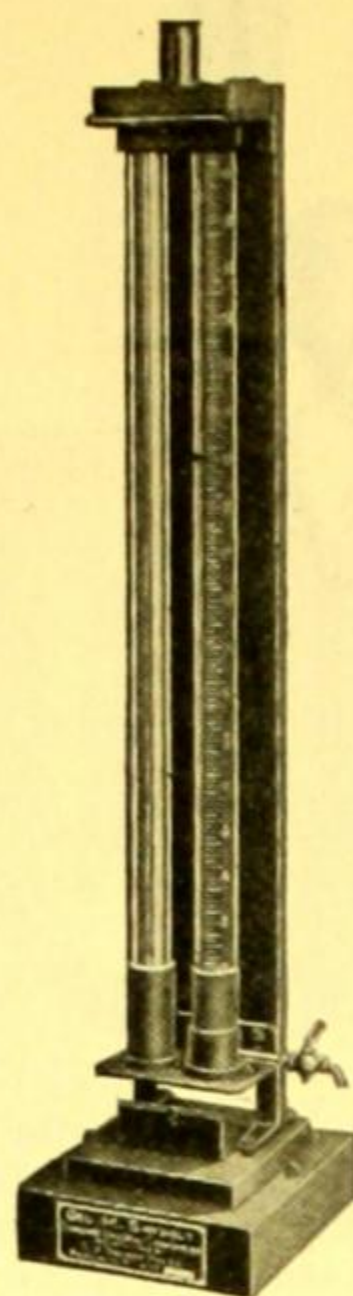


No. 3080.

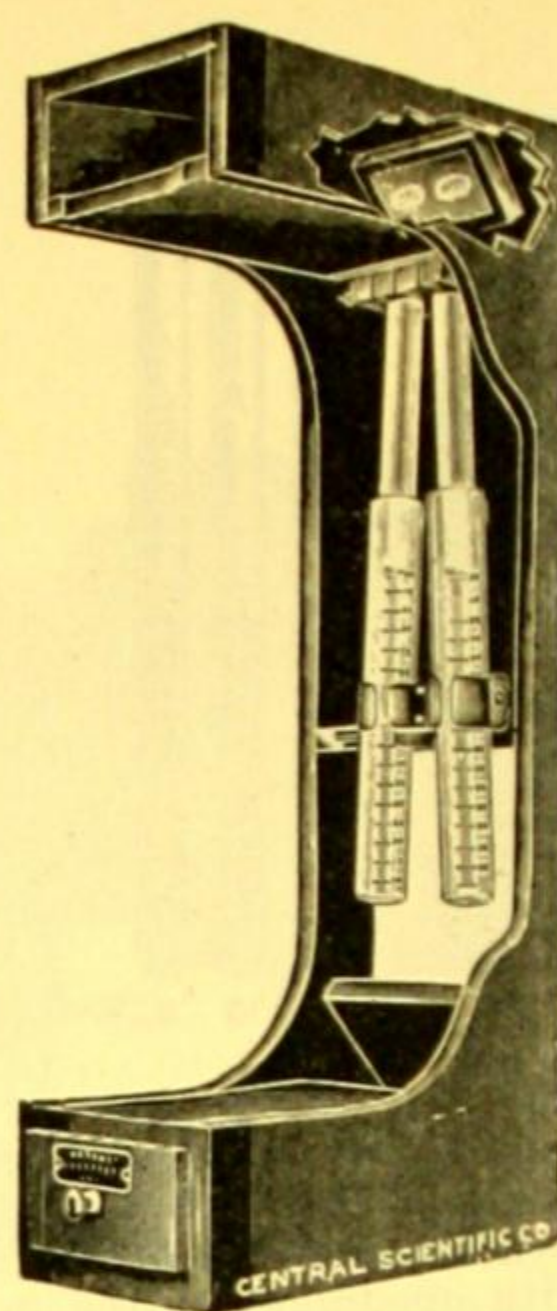
3052. **COLORIMETER, Kuttner's Micro**, for directly estimating haemoglobin and sugar in the blood; uric acid, creatine, and creatinine in blood and urine; and for determining the renal function according to the method of Rowntree and Gerahty. The instrument consists of a closed upright box, 2.5 x 2.5 x 8.5 cm, with openings for the graduated and the standard color tubes. The tubes are viewed through a window, in the front, provided with a Helmholtz double plate, which shows the colors in a continuous band, rendering the comparison very exact. A sliding door forms the front of the box and affords protection to the prism. The size of the outfit enables it to be carried in the pocket. Complete with housing of hard rubber, with Helmholtz double prism and sliding door; one each pipettes 25 cmm, 0.1 cc, 0.2 cc, and 2 cc; two graduated 10 cc test tubes; one transfer pipette; graduated solution tube holding 140 cmm; and pocket carrying case with sufficient space for several standard color tubes. (See Journal of the American Medical Association for July 17, 1915, pages 245 and 246; and for April 29, 1916, pages 1370-1373)..... \$22.00

STANDARD COLOR SOLUTION TUBES FOR USE WITH KUTTNER MICRO-COLORIMETER, TESTED AND APPROVED BY DR. KUTTNER.

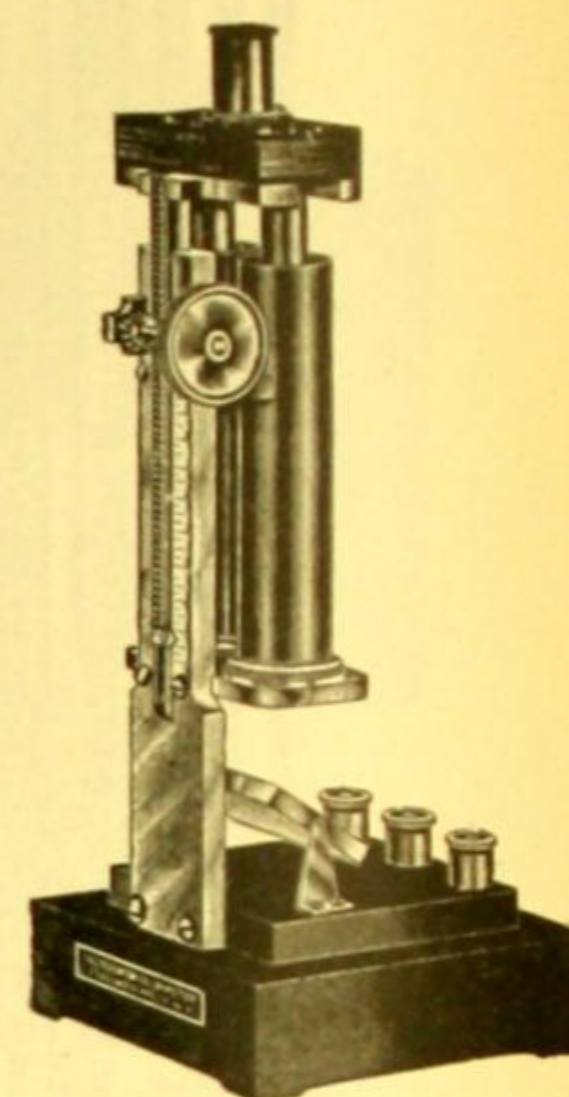
3068. **Haemoglobin Test Standard Tube**, equivalent to 15 grams haemoglobin or 20 cc oxygen (O_2)..... 2.25
3069. **Carbonyl Haemoglobin Standard Tube**, equivalent to 20 per cent. oxygen (O_2)..... 6.00
3070. **Sugar Test Standard Tubes**, a set of two, A and B, the former being equivalent to 0.1 per cent. of sugar, the latter having twice that concentration.
- | | | |
|----------------|------|------|
| No. | A | B |
| Per tube | 1.50 | 1.50 |
3071. **Phenol-Sulphone-Phthalein Test Standard Tubes**, a set of three, the No. 1 tube reading directly in percentage, the Nos. 2 and 3 tubes being weaker in the proportions 2 and 4.
- | | | | |
|----------------|------|------|------|
| No. | 1 | 2 | 3 |
| Per tube | 1.50 | 1.50 | 1.50 |
3072. **Uric Acid Test Standard Tubes**, for determining uric acid in blood, a set of two, A and B, the former being equivalent to 0.01 mg and the latter to 0.005 mg.
- | | | |
|----------------|------|------|
| No. | A | B |
| Per tube | 1.50 | 1.50 |
3073. **Uric Acid Test Standard Tube**, for determining uric acid in urine and stone, equivalent to 0.02 mg..... 1.75
3074. **Creatine and Creatinine Test Standard Tubes**, for urine, a set of two, A and B, the former equivalent to 0.01 mg, the latter to 0.02 mg.
- | | | |
|----------------|------|------|
| No. | A | B |
| Per tube | 1.50 | 1.50 |
3075. **Creatinine Test Standard Tubes**, for blood, a set of two, A and B, the former equivalent to 0.01 mg, the latter to 0.02 mg.
- | | | |
|----------------|------|------|
| No. | A | B |
| Per tube | 1.50 | 1.50 |
3080. **COLORIMETER, Meyers**, a simple and inexpensive dilution colorimeter for clinical purposes, suggested by Prof. Victor C. Myers of the New York Post Graduate Medical School, for the clinical estimation of urea, uric acid, creatine, creatinine and blood sugar; for the renal function test, etc. Consists of two glass tubes of identical bore (1.2 x 26 cm) graduated in tenths from 5 to 25 cc, placed in a black lacquered, brass holder, which holds the tubes firmly in the correct position for matching colors, between the 1 x 2 cm observation window and the white glass background. A dilution pipette is supplied for diluting the unknown until it matches the standard. The most satisfactory results are obtained by using a known amount of the substance to be determined in solution as a standard and treating both solutions in the same manner. The calculations with this instrument are very simple. (See the Journal of Laboratory and Clinical Medicine, Vol. 1, No. 10, for July, 1916, page 760)..... 12.00
- 3080A. **Graduated Tubes**, for No. 3080..... per pair 3.20
- 3080B. **Pipette**, for No. 3080..... .75



No. 3093.

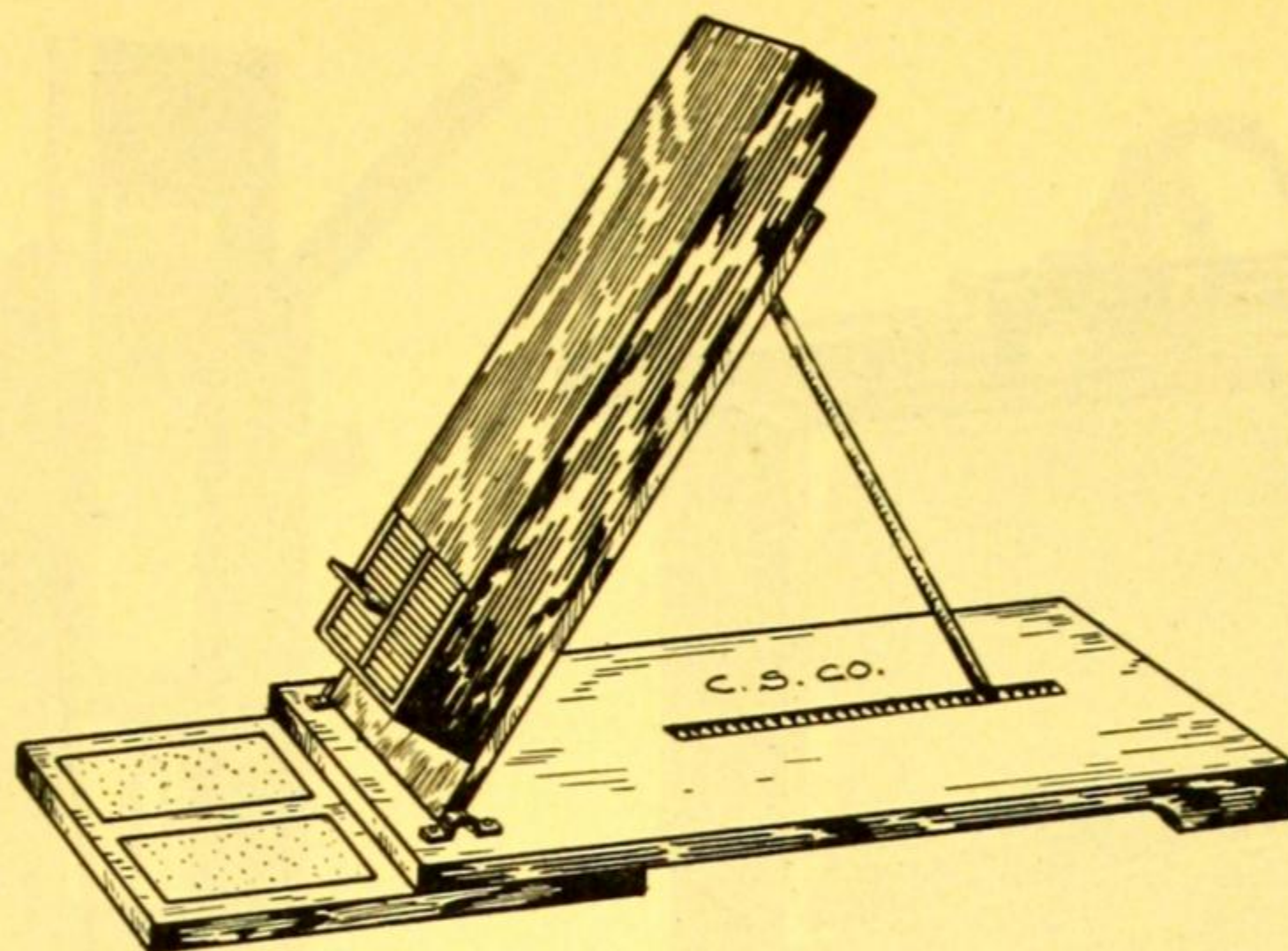


No. 3094.



No. 3097.

3093. **COLORIMETER, Saybolt Universal Chromometer**, adopted as the standard instrument by the U. S. Government and the National Petroleum Association for determining the color shades of refined petroleum. The instrument consists essentially of two removable glass color comparison tubes, one being arranged for the insertion of the standard yellow glass disks in the bottom, the other being graduated in inches and having a brass draw off cock in the bottom to adjust the height of the oil column. The graduated tube is divided by eighth inches up to 20 inches. In addition to the comparison tubes, the instrument is furnished with a prismatic eye-piece which brings into single eye-vision a field with one half illuminated by light reflected through the plain tube containing the yellow glass standard, and the other half illuminated by light reflected through the column of oil under examination in the graduated tube. To make the comparison, one of the standard glasses is inserted in the plain tube for oils with a color shade of from +25 to +16, and both of the glasses for oils of from +15 to -9, and the oil slowly drawn off until the field viewed through the eyepiece is of a uniform color. The color shade value is then found in the table which accompanies the instrument for the corresponding height of the oil column. Zero color shade is equivalent to "standard white" and +21 color shade to "water white." (See Bulletin No. 5 of the U. S. Government Committee on Standardization of Petroleum Specifications.) Complete with two standard color glasses, color table and direction card, in wooden carrying case \$80.00
- 3093A. **Standard Color Glasses**, for No. 3093.....each 15.00
3094. **COLORIMETER, Schreiner's**, as used in the Laboratory of the Bureau of Soils, United States Department of Agriculture. The Colorimeter consists essentially of two graduated glass tubes which contain the standard and the unknown colorimetric solutions, with two smaller glass immersion tubes, by means of which the length of the column of liquid in the graduated tubes may be changed. Complete with graduated and plain tubes. (For full description see Journal of the American Chemical Society, Volume XXVII, September 9, 1905, and Bulletin No. 31, United States Department of Agriculture, Bureau of Soils)..... 30.00
3095. **Tubes, Graduated**, for No. 3094, with 100 scale divisions, 2mm apart.....per pair 4.00
3096. **Tubes, Immersion**, for No. 3094, 26 cm long with polished bottoms.....per pair 1.25
3097. **COLORIMETER, Tag-Robinson**, for determining the color shades of lubricating oils. This instrument is of the same general type as the Saybolt Universal Chromometer, except that, as the depth of the oil under test need not be varied through so great a distance, the variation is accomplished by an immersion tube, which is raised and lowered by means of a rack-and-pinion device. The readings are made on the face of the instrument opposite the index, which indicates the depth of oil necessary to match the color shade of the standard color glass screwed into the color standard plunger. The three standard color glasses which are provided represent the true colors of the oil, and with them the complete range of color shades for lubricating oils is secured, including all of the National Petroleum Association colors. Complete as described, with three standard color glasses mounted to screw into the color standard plunger, color table and direction card, in wooden carrying case..... 100.00
- 3097A. **Standard Color Glasses**, mounted to screw into color standard plunger of No. 3097.
- | | | | |
|------------|-------|-------|-------|
| No. | 1 | 2 | 3 |
| Each | 12.50 | 12.50 | 12.50 |



No. 3105.

COLORIMETERS, LOVIBOND TINTOMETERS

3105. **TINTOMETER, Lovibond, Observation Instrument only**, of improved form, combined monocular and binocular, suitable for all general work such as the measurement of the color of liquids or solids. The instrument is leather covered and is supplied on an adjustable stand which is required for work with solids. Observation instrument only, with stand but without trays, pressing block for solids, troughs for liquid or color glasses..... \$28.00

3105A. **TRAYS**, into which powdered material may be pressed to enable color measurements to be madeper doz. 2.70

3105B. **PRESSER**, for pressing powdered material into the trays so that they may offer a uniform surface upon which color measurements may be made 1.60

3105C. **STANDARD COLOR GLASSES**. These glasses are furnished in the three dominant colors of the spectrum, red, yellow and blue, for general work. For each of these colors there are a series of 155 shades of color, graduated from .01 to 20.0 tint units. There are 465 color glasses in all in these three colors. The tint units are derived from the wave length values of the diffraction spectrum which lie between A760400 and H396319. This range is divided into 100 parts which are the tint units. Each tint unit, therefore, covers a range of 3640 wave lengths. For colorimetric testing of specific substances, arbitrary color ranges have been chosen which are not pure color tints. These are merely known as color glasses of a numbered series as for example the "50 Brown" and "52 Brown" series, the "500 Amber" series for refined oils, etc.

To reproduce the National Petroleum Association colors, when examining oils contained in the standard 4-ounce oil sample bottle, Lovibond color glasses must be used as follows:

N. P. A. No.	3	3.5	4	4.5	5	6
Lovibond Glasses { 200 Red Series....	6.9	7.8	14.00	21.00	35.00	60.00
510 Yellow Series. 32.0	39.0	50.00	35.00	93.00	60.00	
1180 Blue Series....	....	....	.55	.55	....	.55

Single color glasses, any series or number, as described.....each 2.00

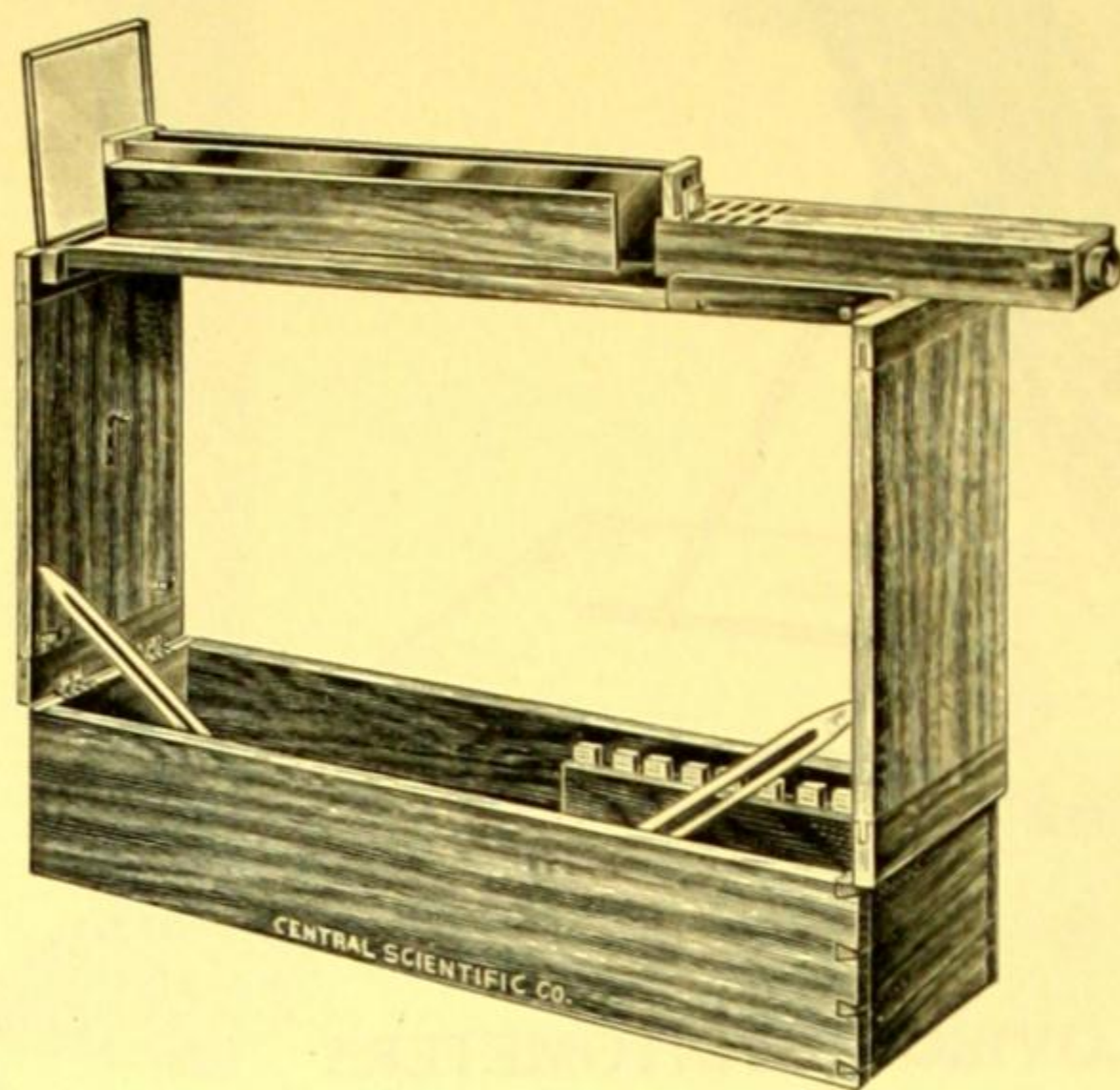
Note:—In ordering, specify color series and number.

3105D. **STANDARD WHITE**, for obtaining a pure white back ground for matching colors of solids with Lovibond color glasses, in 4 ounce bottles.....per bottle .45

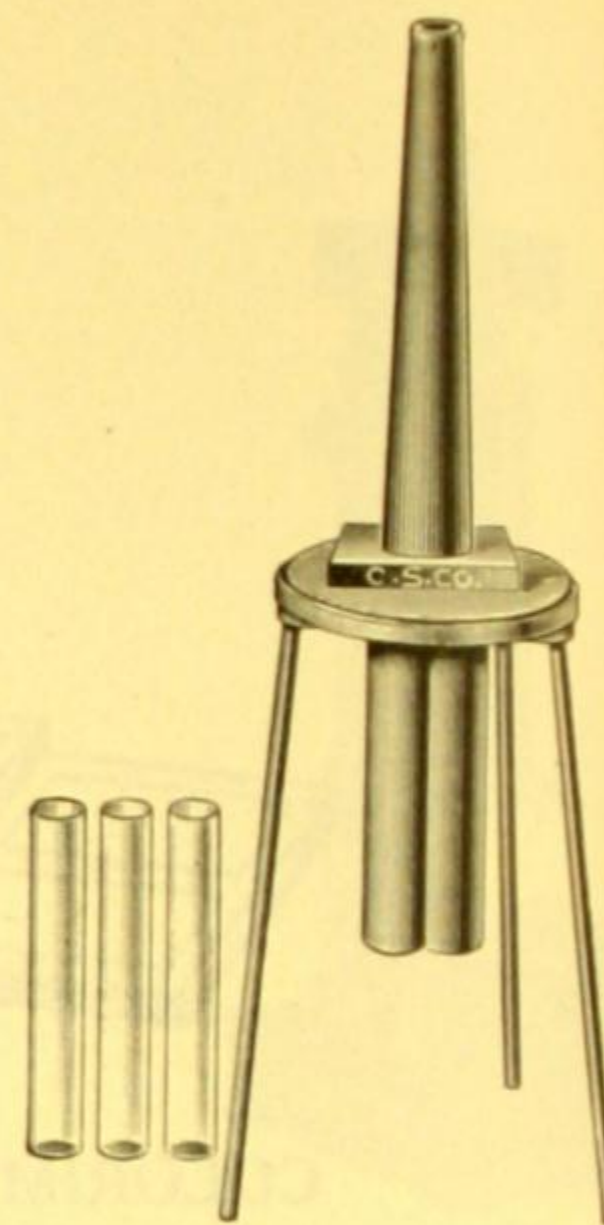
3105E. **METAL TROUGHs**, silver plated, accurately gaged, with parallel plate glass ends, to hold liquids whose color is to be matched with Lovibond color glasses.

Length, inches	1/16	1	18
Each	7.20	7.20	18.00

3106. **TINTOMETER SET, Lovibond, for Flour**. A valuable equipment for milling laboratories for standardizing the quality of flour by its color, and for detecting bad milling and blending wheats for flour. A fair index of the gluten and starch content may be obtained from the color values. The set consists of one improved observation instrument, six trays, one presser, one bottle of standard white and 54 standard color glasses as follows: 14 glasses series 200, 27 glasses series 510, 10 glasses series 1180 and 3 colorless glasses. Complete as described 126.00



No. 3107.

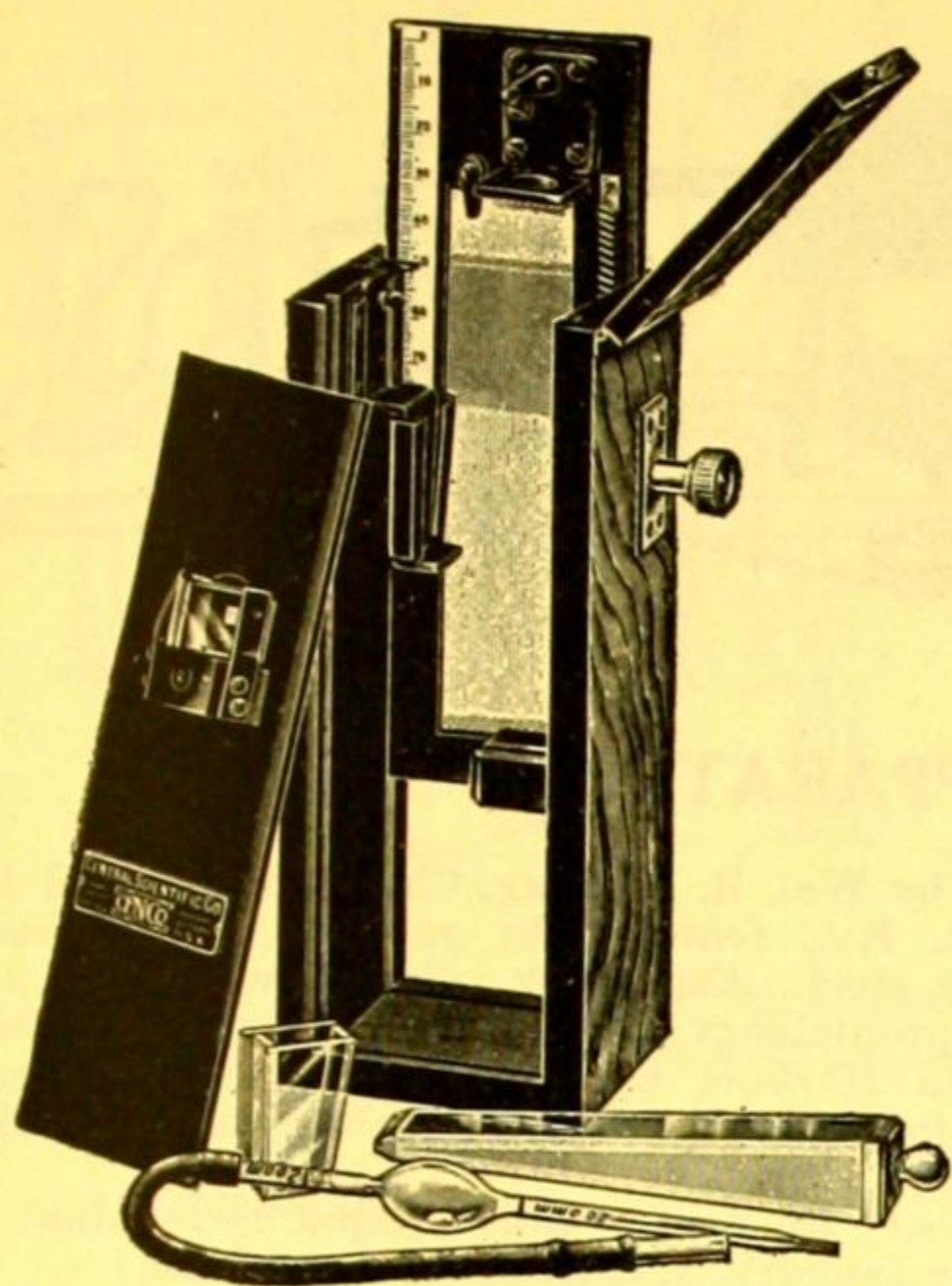


No. 3109.

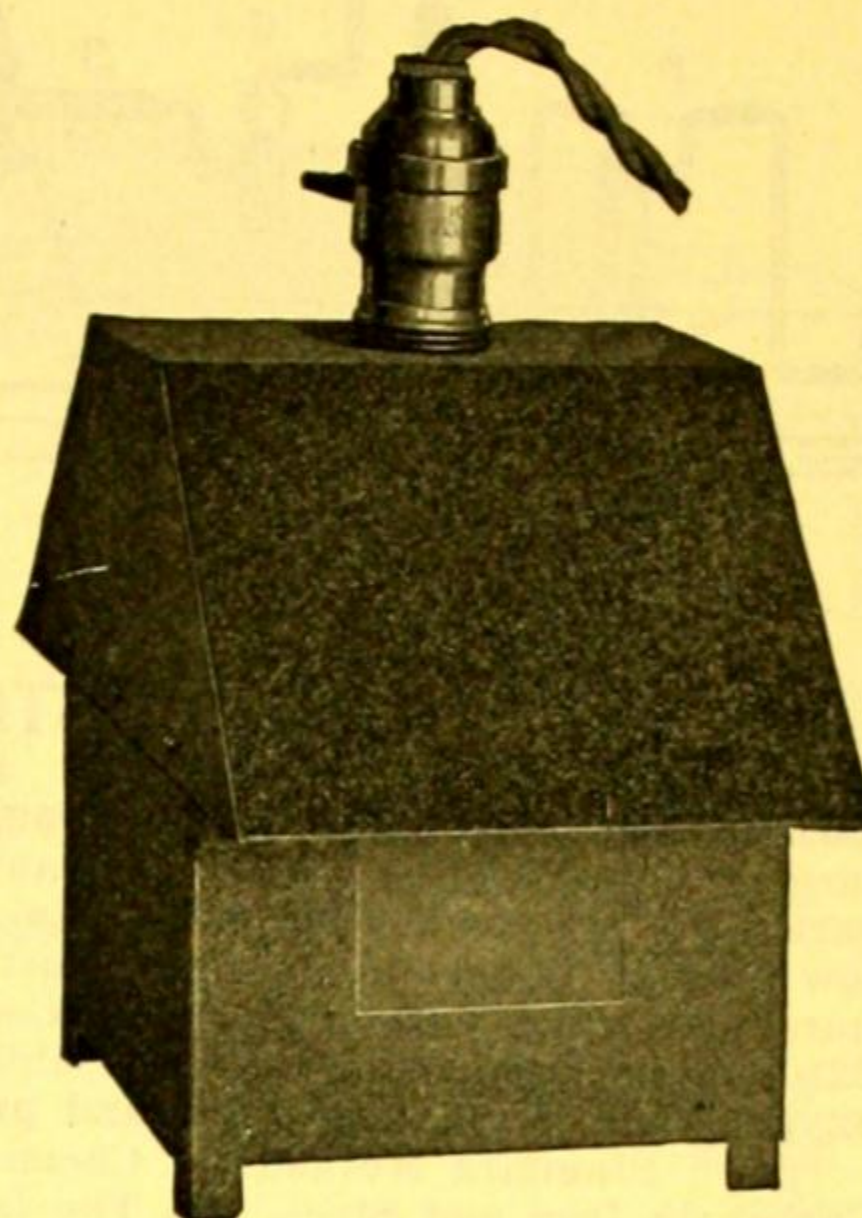
3107. **TINTOMETER SET, Lovibond, for Standardizing Merchantable Petroleum.** This set has been the standard of petroleum refineries for many years for gasoline and burning oils as it offers a very simple means of grading these products. Consists of one monocular observation instrument; one 18 inch silvered metal trough with glass ends; one reflector; 4 special standard glasses for water white, standard white, superfine white and prime white oils; and a hardwood case, constructed to open up in the form of a stand which, when placed on a table of ordinary height, will bring the eye piece of the observation instrument in line with the eye. Complete as described \$72.00
3108. **TINTOMETER SET, Lovibond, for Merchantable Petroleums, Intermediate, Russian and Lubricating Oils.** Refineries producing lubricating oils in addition to gasoline and burning oils are able to make color determinations on their entire line with this enlarged equipment. Consists of one monocular observation instrument; one 18 inch and one $\frac{1}{16}$ inch silvered metal troughs with glass ends; one reflector; nine standard color glasses for water white, standard white, superfine white, prime white, 1.5, 3, 4, 5, and 7; and a hardwood case as furnished with No. 3107. Complete as described..... 96.00
3109. **TINTOMETER SET, Lovibond, Wesson Type, for Cotton Seed Oil.** This set is especially designed for the rapid grading of cotton seed oils by means of the Lovibond standard color glasses. The metallic observation instrument is mounted on a tripod. With it samples of oil are measured in $6 \times \frac{7}{8}$ inch glass tubes instead of in the 4 ounce oil sample bottle as formerly. The centers of the colored fields are only $\frac{3}{4}$ inch apart instead of $1\frac{1}{2}$ inches. A set of 27 standard color glasses are supplied with the instrument, as follows: One each Red 0.1, .2, .3, .4, .5, .6, .7, .8, .9, 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10; and one each yellow 1, 2, 4, 6, 8, 10, 20 and 35. Three glass tubes are furnished for containing the oil under test. Complete as described 62.50
3110. **TINTOMETER SET, Lovibond, Wesson Type, for classifying Cotton Seed Oils above or below Prime Color.** Consists of the observation instrument, with three glass tubes as described under No. 3109 but one only compound standard color glass (Red 7.1 and Yellow 35.0) instead of the 27 glasses listed under No. 3109. Complete as described..... 16.50
- 3110A. **OIL TUBES, Glass, 6 by $\frac{7}{8}$ inches, as supplied with Wesson Type Tintometer.....each .60**

TEXT BOOKS ON THE TINTOMETERS.

- 3111A. "Measurement of Light and Colour Sensations," by Joseph W. Lovibond..... 3.25
- 3111B. "Light and Colour Theories," by Joseph W. Lovibond 3.25

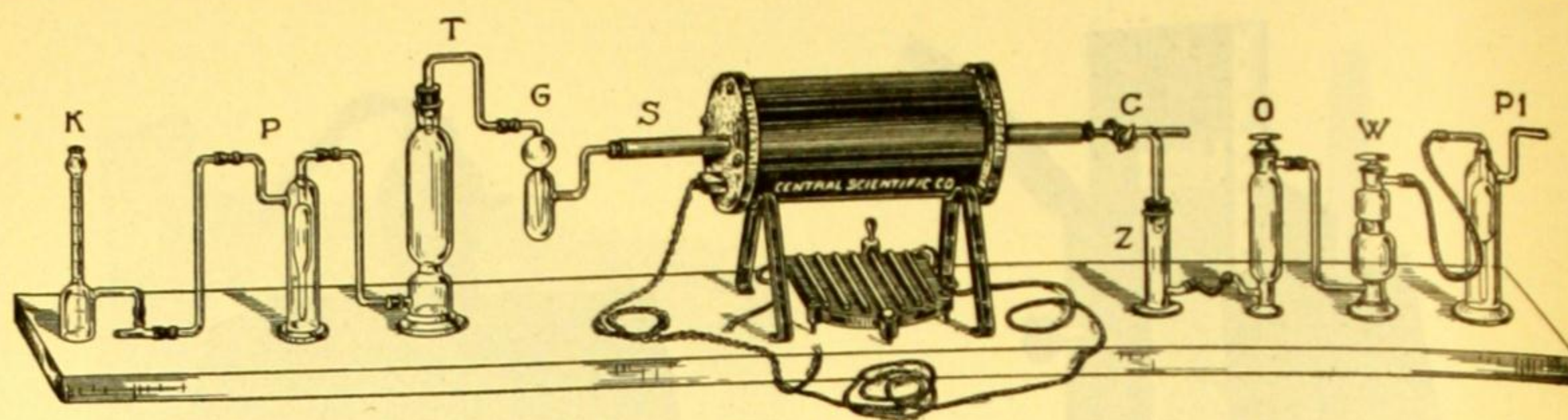


No. 3112, 3112A, B and C.



No. 8705.

3112. **COLORIMETER, Universal, after Autenrieth and Koenigsberger**, consisting of a hardwood case, the front and back of which are in the form of removable slides. The back is fitted with a ground glass window through which both the glass trough containing the liquid under examination and the glass wedge containing the standard color solution are illuminated, a celluloid millimeter scale from which the readings are made, and an adjustable clamp for holding the glass wedge. The back is moved up and down by means of a rack-and-pinion. The front slide is fitted with a slit plate which forms the observation window, and a Helmholtz double plate which juxtaposes the fields of the unknown and standard. These two fields appear as a continuous field with a hair line separating the two parts. This arrangement enables the most inexperienced operator to match the colors accurately. The glass trough for the liquid under examination is held in a easily removable metal slide fitting on the inside of the left hand wall of the colorimeter. A complete description of the methods for using this colorimeter, together with directions for making the standard color solutions will be found in "The Newer Methods of Blood and Urine Chemistry" by Gradwohl and Blaivas. Colorimeter complete as described, without glass wedge or trough..... \$35.00
- 3112A. **Glass Trough**, to contain the liquid under examination 4.00
- 3112B. **Glass Wedge**, with ground glass stopper, to contain liquid color standards prepared in the laboratory 8.50
- 3112C. **Pipette**, graduated 20 cmm and 2 cc, with rubber tubing and mouth piece..... 1.50
8705. **COLORIMETER LAMP, Chalet Form**, a powerful light source of daylight quality for colorimetric determinations following the design suggested by Prof. Simon H. Gage of Cornell University, with the modifications suggested by Dr. H. S. Newcomer of Pennsylvania Hospital, Philadelphia. (See Journal of Biological Chemistry, Vol. XXXVII, No. 3, for March 1919.) The illuminant is a 100 watt, 110 volt mazda lamp in a light tight housing, with projecting eaves to shade the eyes of the worker, and with a window equipped with Corning Daylite glass, 82 x 82 mm, giving an almost pure white light. The spherical mirror of strong curvature reflects the light from the bulb which is carried in an adjustable plate for focusing and centering the filament with reference to the mirror reflector. Complete as described, with cord, switch and plug for 110 volt circuit..... 19.50
8706. **Lamp Bulb**, 100 watt, 110 volt mazda bulb, for replacement in No. 8705..... 2.00
8707. **Resistance**, for use with No. 8705 on 220 volt circuit 8.00



No. 3115.

COMBUSTION APPARATUS

COMBUSTION APPARATUS, Fleming, designed by Wm. R. Fleming, Chief Chemist and Metallurgist of the Andrews Steel Company, Newport, Ky., featured by rapidity for determining carbon by the combustion method in any iron or steel. Especially valuable when used to follow a bath of steel in the open-hearth furnace preliminary to tapping, in that it abolishes the unreliable color carbon method. Complete with Hoskins Electric Combustion Furnace No. 6210, rubber stoppers, glass and rubber connections and fused silica combustion tube; **without oxygen tank, regulating valve and pressure gage.**

(See "Standard Methods of Chemical Analysis," by Scott; and "Rapid Determination of Carbon in Iron and Steel," in The Iron Age for January, 1913, and January, 1914.)

		A	B
No.		110	220
For volts			
3115.	Each without rheostat.....	\$54.50	54.50
3116.	Each with rheostat.....	65.50	65.50

COMBUSTION APPARATUS, Fleming, same as No. 3115, but with Multiple Unit Electric Combustion Furnace No. 6226.

		A	B
No.		110	220
For volts			
3117.	Each without rheostat.....	54.50	54.50
3118.	Each with rheostat.....	64.50	64.50

Parts for Fleming Combustion Apparatus

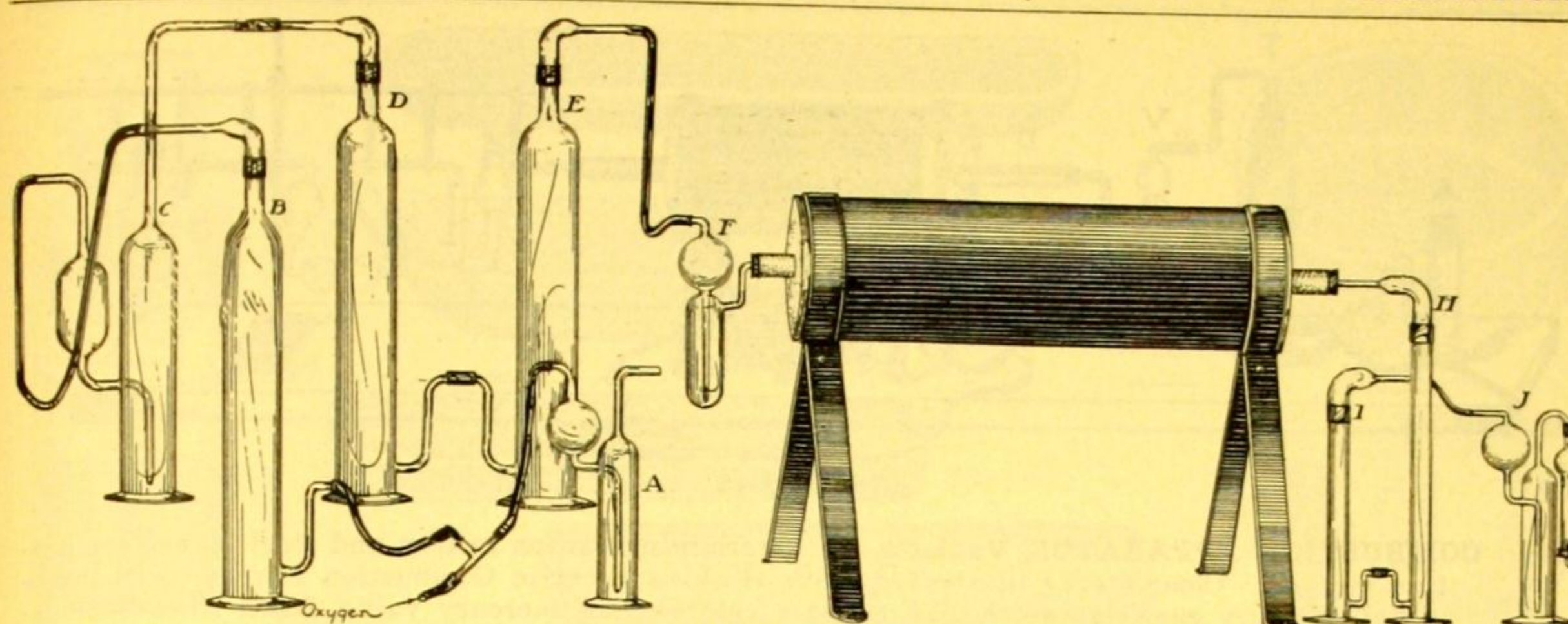
3119A.	Mercury Pressure Gage (K), for the detection of leaks and stoppages.....	2.00
3119B.	Washing Bottles (P and PI), for caustic potash solution, two required.....each	2.00
2300.	Calcium Chloride Jar (T), 12 inch size.....	1.40
3119C.	Mercury Valve (G), to prevent reverse action and to absorb sulphur from rubber tubing.	.90
3184F.	Silica Tube (S), 30 inches long, $\frac{7}{8}$ inch inside diameter	7.75
3119E.	Zinc Jar (Z) for 20 mesh zinc, to absorb acid, lead, sulphur and chlorine fumes.....	1.00
3119F.	Stop-Cock (C), used when it is not desirable to pass gases thru jars Z and O.....	2.00
3119G.	Phosphorus Anhydride Jar (O), to absorb water	3.00
114.	Fleming Absorption Tube (W).....	5.00
3119H.	Glass Tubing Connections, consisting of six pieces	per set 1.30

3120. **COMBUSTION APPARATUS, C. M. Johnson's**, for the determination of carbon in iron, steel, ferro-alloys, etc. Complete as illustrated with Hoskins Electric Combustion Furnace, mercury pressure gage, drying jar for solid absorbents, safety jar for potassium hydroxide solution, calcium chloride and soda lime jars, mercury valve, fused silica combustion tube, jar for granular zinc, jar for phosphorus pentoxide, absorption tube for carbon dioxide, and connections. (See "Rapid Methods for the Chemical Analysis of Special Steels, Steel Making Alloys, and Graphite," by C. M. Johnson.)

		A	B
No.		110	220
With furnace and rheostat for, volts.....			
	Each	53.75	53.75

3122. **COMBUSTION APPARATUS, C. M. Johnson's**, same as No. 3120, but with Multiple Unit Electric Combustion Furnace No. 6226.

		A	B
No.		110	220
With furnace and rheostat for, volts.....			
	Each	52.75	52.75



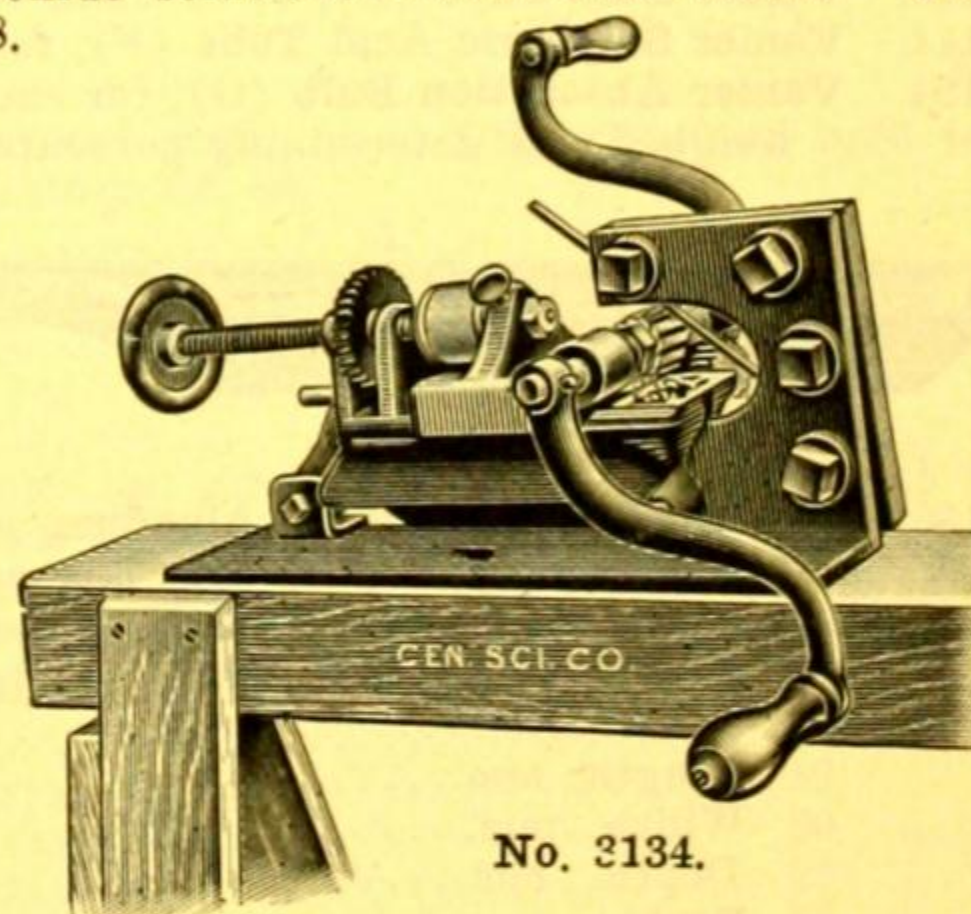
Nos. 3120-2.

Parts for Johnson's Combustion Apparatus.

Hoskin's Electric Combustion Furnaces.

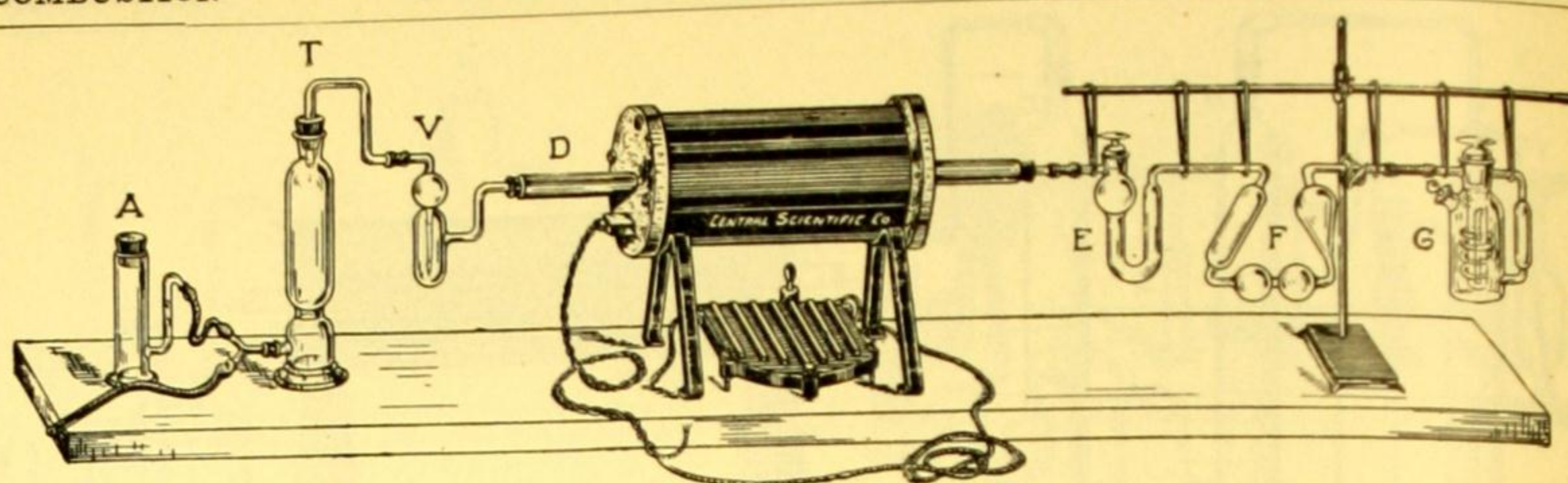
No.	A	B
For volts	110	220
6210. Furnace only	\$26.00	26.00
6211. Furnace with rheostat	37.00	37.00
Multiple Unit Electric Combustion Furnace, for use on either 110 or 220 volts.		
6226. Furnace only		26.00
6227. Furnace with rheostat (voltage must be specified)		36.00
3184B. Combustion Tube, of opaque fused silica for Nos. 3120 and 3122, 24 inches long and $\frac{3}{4}$ inch inside diameter		5.00
3123. Mercury Pressure Gage, (A) to indicate leakage of joints or stoppage of flow		1.10
3124. Jar for Solid Absorbent, (B) such as potassium hydroxide sticks		1.40
3125. Safety Jar, (C) for potassium hydroxide solution		1.40
3126. Calcium Chloride Jar, (D)		1.40
3127. Soda Lime Jar, (E)		1.40
3119C. Mercury Valve, (F) to prevent back flow		.90
3129. Jar for Granular Zinc, (H) to absorb acid, lead, sulphur, and chlorine vapors		.80
3130. Jar for Phosphorus Pentoxide, (I) to absorb water		.60
3131. Absorption and Weighing Apparatus for Carbon Dioxide, (J), to be weighed for calculating percentage of carbon		2.30
3132. Absorption Tube only of No. 3131, for potassium hydroxide solution		1.80
Combustion Tube, Clay, C. M. Johnson's, see No. 3178.		

3134. **MILLING MACHINE, C. M. Johnson's**, for obtaining iron and steel samples for use in combustion apparatus. Especially useful for obtaining samples from wire and sheet metal. This machine consists of a heavy iron frame, at one end of which is a vise for clamping the pieces of wire or sheet metal of which a sample is desired. A milling cutter of high-speed steel is turned by means of the handles shown and automatically fed forward against the sample by means of a set of gears. The millings may be caught on a piece of cardboard of just the right size, and are ready to be weighed into the boat. The cutter may be sharpened several times. Complete with extra milling cutter and double wrench.. 60.00



No. 3134.

COMBUSTION APPARATUS, Stetser-Norton. Since this apparatus does not differ materially from the Vanier Combustion Apparatus described and illustrated under No. 3138, it is not described in detail. By the substitution of the Ascarite filled Stetser-Norton Bulb No. 123A for the Vanier Bulb, and the use of stock apparatus such as aspirator bottles and wide mouthed wash bottles found in every chemical laboratory, a Vanier train may be easily converted into a Stetser-Norton train. Prices will be quoted on request on either the complete train or any of the component parts of it. For complete description, see The Iron Age, Vol. C II, No. 8, "Combustion Train for Carbon Determinations" by J. B. Stetser and R. H. Norton of the Penn Seaboard Steel Corporation.



Nos. 3138-40.

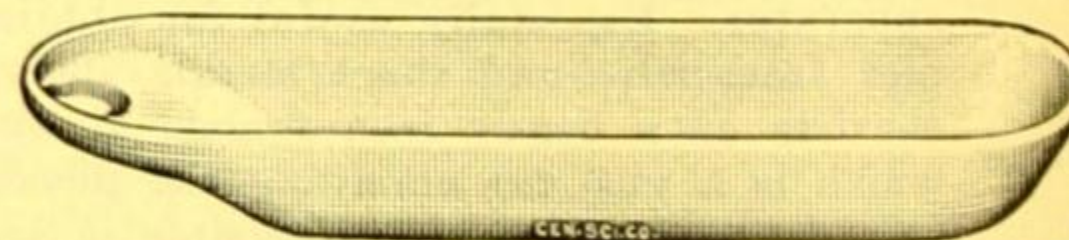
3138. **COMBUSTION APPARATUS, Vanier's**, for determining carbon in iron and steel by the combustion method. Complete as illustrated, with Hoskins Electric Combustion Furnace with rheostat, mercury gage and safety jar, calcium chloride jar, mercury valve, fused silica combustion tube, zinc tube, sulphuric acid bulb, Vanier's Combined absorption bulb and drying tube (patented), two $3\frac{3}{4} \times \frac{5}{8}$ inch Alundum combustion boats, 1 lb. of R. R. Alundum and with necessary connecting tubing, support, clamp, glass rods, etc., but **without** pressure regulator.
- | | | |
|---|---------|-------|
| No. | A | B |
| With furnace and rheostat, for volts..... | 110 | 220 |
| Each | \$58.00 | 58.00 |
3140. **COMBUSTION APPARATUS, Vanier's**, same as No. 3138, but with Multiple Unit Electric Combustion Furnace No. 6226. No.
- | | | |
|---|-------|-------|
| No. | A | B |
| With furnace and rheostat, for volts..... | 110 | 220 |
| Each | 57.00 | 57.00 |

Parts for Vanier Combustion Apparatus.

- | | | |
|---|-------|-------|
| Hoskins Electric Combustion Furnaces. No..... | A | B |
| For volts | 110 | 220 |
| 6210. Furnace only | 26.00 | 26.00 |
| 6211. Furnace with rheostat..... | 37.00 | 37.00 |
- Multiple Unit Electric Combustion Furnaces, for use on either 110 or 220 volts.
- | | |
|---|-------|
| 6226. Furnace only | 26.00 |
| 6227. Furnace with rheostat (voltage must be specified) | 36.00 |
- 3141A. Mercury Gage and Safety Jar (A), for indicating amount of pressure and acting as safety valve
- | | |
|---|------|
| 14010B. Glass Y-Tube, inside diameter 5 mm..... | .10 |
| 2300. Calcium Chloride Jar (T), 12 inch, to be filled with absorbent material for drying the oxygen | 1.40 |
| 3119C. Mercury Valve (V), for preventing back flow | .90 |
| 3184B. Combustion Tube (D), of Opaque Fused Silica, glazed, 24 inches long and $\frac{3}{4}$ inch inside diameter. | 5.00 |
| 3143. Vanier Zinc Tube (E), to be filled with granulated zinc for removing sulphur and acid fumes | 1.25 |
| 3144. Vanier Sulphuric Acid Tube (F), for absorbing moisture | 2.00 |
| 124. Vanier Absorption Bulb (G), for carbon dioxide, a combined potash and drying tube, to be weighed, for determining percentage of carbon in sample | 6.00 |

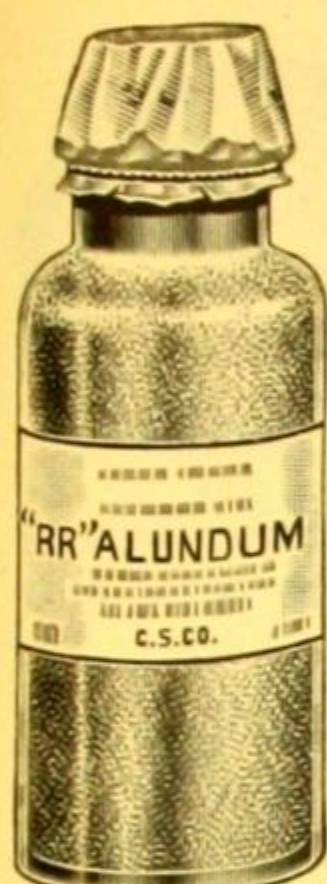


No. 3150.



No. 3153.

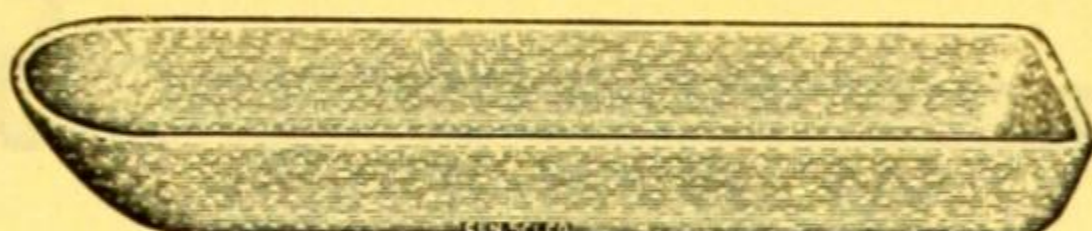
3150. **COMBUSTION BOATS, Alundum**, especially adapted for the determination of carbon in iron and steel. R. R. Alundum is recommended to protect the boats from the slagging effect of the iron oxide formed during the combustion of the sample. Furnished in fine mixture RA84 only. Thickness of wall, $1\frac{1}{2}$ mm. With handle.
- | | | | | | |
|-----------------|-----|-----|-----|-----|-----|
| No. | A | B | C | D | E |
| Length, mm..... | 90 | 97 | 115 | 122 | 133 |
| Width, mm..... | 13 | 18 | 18 | 19 | 13 |
| Depth, mm..... | 7 | 10 | 11 | 11 | 7 |
| Each | .30 | .35 | .40 | .40 | .40 |
3151. **COMBUSTION BOAT, Nickel**, length, 75 mm; width, 13 mm..... .60
3153. **COMBUSTION BOATS, Coors Porcelain**, glazed inside and outside with exception of outside bottom surface. With handle.
- | | | | | | |
|-----------------|-----|-----|-----|-----|-----|
| No. | A | B | C | D | E |
| Length, mm..... | 60 | 60 | 88 | 97 | 100 |
| Width, mm..... | 7 | 10 | 12 | 16 | 20 |
| Depth, mm..... | 8 | 8 | 8 | 10 | 13 |
| Each | .26 | .26 | .30 | .32 | .34 |



No. 3160.



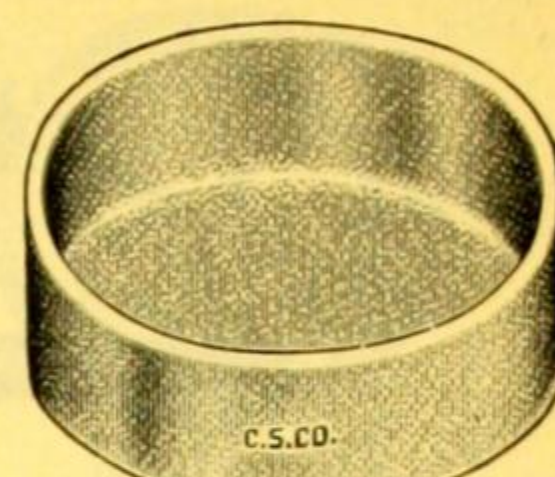
No. 3154.



No. 3156.



No. 3162.



No. 3164.



No. 3166.

3154. **COMBUSTION BOATS**, Johnson's, of vitrified clay, without handle. Thickness of wall, $1\frac{1}{2}$ mm.

No.	A	C
Length, mm.	100	119
Width, mm.	16	16
Depth, mm.	10	10
Each	\$0.17	.19

3156. **COMBUSTION BOATS**, Opaque Fused Silica, glazed on both sides, without handle.

No.	A	B	C
Length inside, mm.	44	76	76
Width inside, mm.	13	13	16
Depth inside, mm.	8	8	10
Each	.65	1.00	1.15

3160. **COMBUSTION BOAT LINING**, of R R Alundum, Blue Label, a very pure crystalline alumina treated to remove carbonaceous matter and surface alkali; used as a lining for boats of platinum, porcelain, clay, nickel and alundum to afford protection from fluxing during combustion. Supplied in glass stoppered bottles in Nos. 46, 60 and 90 mesh.

Please specify mesh in ordering.

Size bottle, pounds.	1	2	5
Each	1.30	1.95	3.70

3162. **COMBUSTION BOAT SHIELDS**, of Alundum, to protect combustion tubes from the spattering of overheated metals.

No.	A	B
Length, mm.	114	140
For use in tube, diameter, mm.	22	25
For use with boat, width, mm.	11	15
Each	2.00	2.00

3164. **COMBUSTION CAPSULES**, of Alundum, for ashing coal, flour, etc. Will withstand high temperature and can be used repeatedly. Made in mixture RA 84.

No.	A	B	C	D
Diameter, inches	$1\frac{1}{32}$	$1\frac{7}{16}$	$1\frac{5}{8}$	$1\frac{3}{4}$
Height, inches	$\frac{7}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$
Capacity, cc.	7	10	18	25
Each	.30	.40	.50	.50

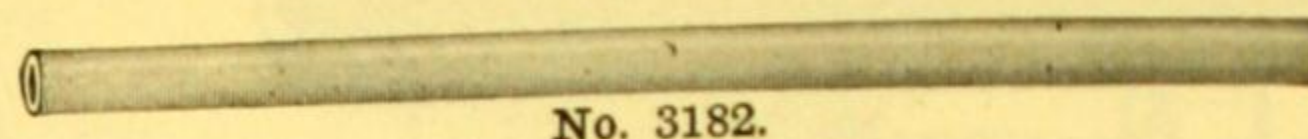
3166. **COMBUSTION CAPSULES**, Coors Porcelain, without lip, glazed inside and outside with exception of outside bottom surface, as recommended for the determination of ash in coal or coke by the American Society for Testing Materials. Size A is recommended as standard. (See A. S. T. M. Standards for 1921, No. D 22-21, and No. D 37-21, for Standard Methods of Laboratory Sampling and Analysis of Coal and Coke.)

No.	A	B
Diameter top, mm.	42	58
Diameter bottom, mm.	20	35
Height, mm.	25	34
Capacity, cc.	25	70
Each	.30	.36

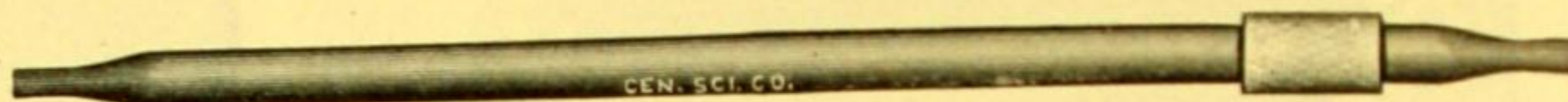
3170. **COMBUSTION CAPSULES**, of Opaque Fused Silica, for ash determinations and ignitions. Depth, $\frac{1}{2}$ inch.

No.	A	C	D
Diameter, inches	$1\frac{3}{8}$	2	$2\frac{3}{8}$
Capacity, cc.	10	20	35
Each	.85	1.15	1.35

For other CAPSULES, see No. 2408.



No. 3182.



Nos. 3178, 79 and 80.

3178. **COMBUSTION TUBES, Clay, Vitrified, C. M. Johnson's**, for use in carbon determinations in iron and steel. (See Journal of Industrial & Engineering Chemistry, Vol. V, No. 7, for July 1913, page 581.)

No.	A	B
Length, inches	23½	27½
Diameter inside, inches	¾	1½
Diameter outside, inches	1¼	1¼
Will take boats up to, inches	5/8	¾
Each	\$5.75	6.50

3179. **Tapered Clay Connectors**, for Combustion Tubes No. 3178, without rubber sleeve.

For tube	A	B
Each	2.00	2.25

3180. **Rubber Sleeves**, for use with Nos. 3178 and 3179.

For tube	A	B
Each	1.75	2.00

3182. **COMBUSTION TUBES, Coors Porcelain**, glazed inside and outside.

No.	B	C	E	F
Length, cm.	60	60	75	75
Diameter inside, mm.	20	25	20	25
Diameter outside, mm.	28	30	28	30
Will take boats up to, mm.	16	20	16	20
Each	6.05	6.55	7.56	8.20

Note:—For special lengths add or subtract 1/100 of price for each cm of difference from stock lengths.

COMBUSTION TUBES, Opaque Fused Silica, melting point about 1500 degrees C.; unaffected by sudden changes in temperature. Thickness of wall, 2 mm.

No.	B	C	E	F
Length, cm.	60	60	75	75
Diameter inside, mm.	18	22	18	22
Will take boats up to, mm.	15	18	15	18
Each, glazed inside only	5.00	6.20	7.00	7.75
Each, glazed inside and outside	6.30	7.50	8.63	9.38

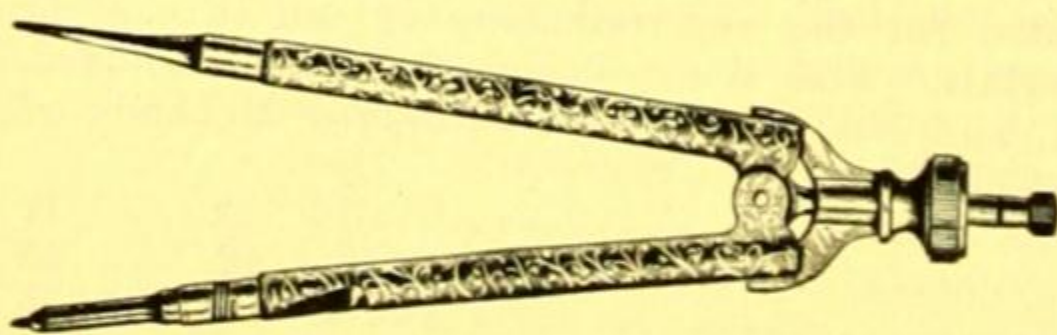
3187. **COMBUSTION TUBES, Hard Glass**, for use in oxidation and reduction experiments, etc.

No.	A	B	C
Length, mm.	200	300	450
Diameter inside, mm.	5	10	19
Each	.15	.20	.70

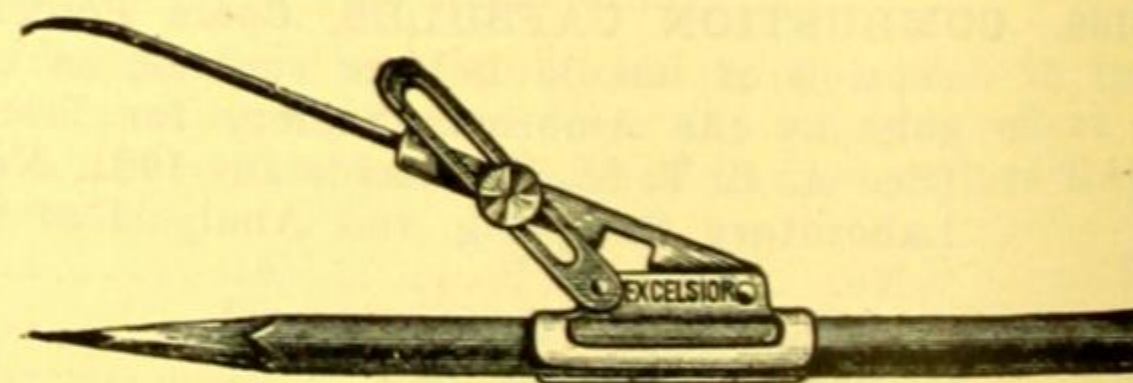
3188. **COMBUSTION TUBES, Hard Glass**, 100 cm long. Thickness of wall, 2 to 3 mm.

Diameter inside, mm.	20	25
Each	1.50	2.00

For **COMBUSTION TUBING** see No. 7206.



No. F521.



No. F523.

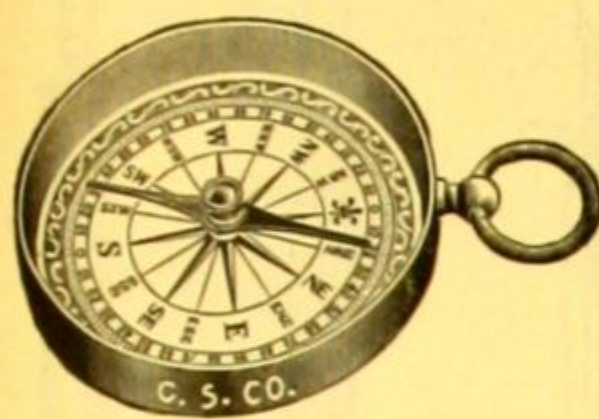
- F521. **COMPASS, Eagle Pencil**. The most universally used school compass. Pen, pencil, divider and compass combined. Provided with set nut. Size, 5½ inches over all. Complete with extra leads.

Each .55
Per dozen 5.50

- F523. **COMPASS, Pencil**. Easily attached to a common pencil. Solid steel leg, durable and accurate.

Without pencil

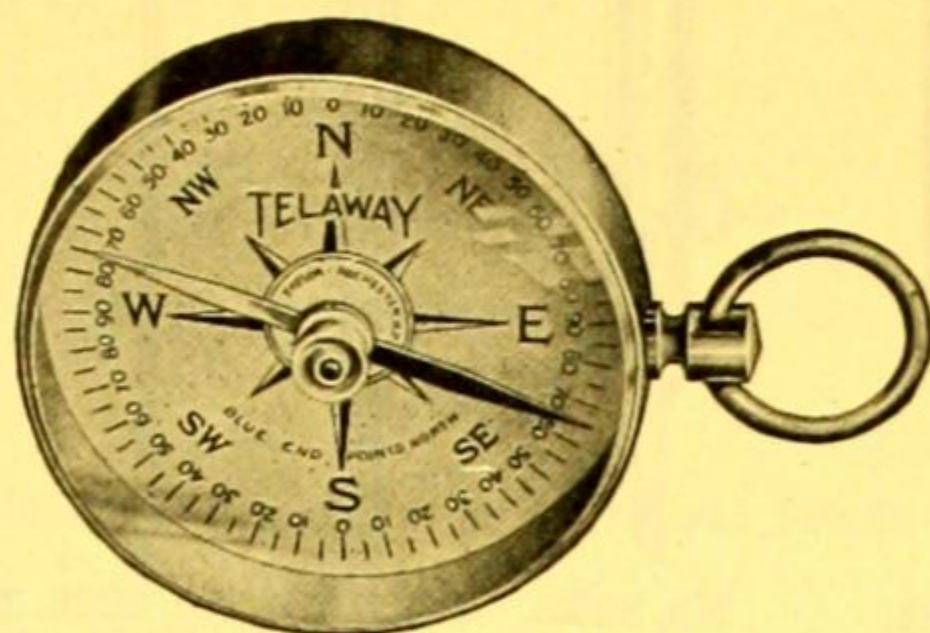
Each .20
Per dozen 2.00



No. F2615.



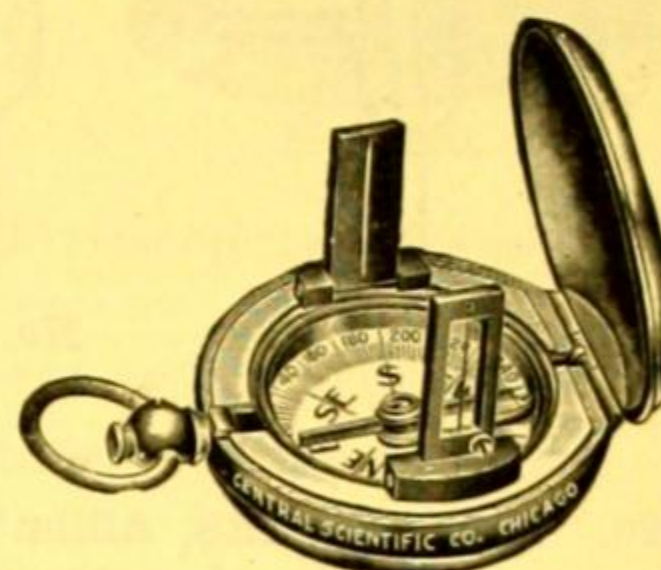
No. F2617.



No. F2619.



No. F2621.



No. F2625.

F2615. **COMPASSES, MAGNETIC.** Metal cap needle, brass case, card dial, beveled glass; the three larger sizes with ring.

Diameter, mm.....	10	16	25	40
Each	\$0.12	.15	.20	.40

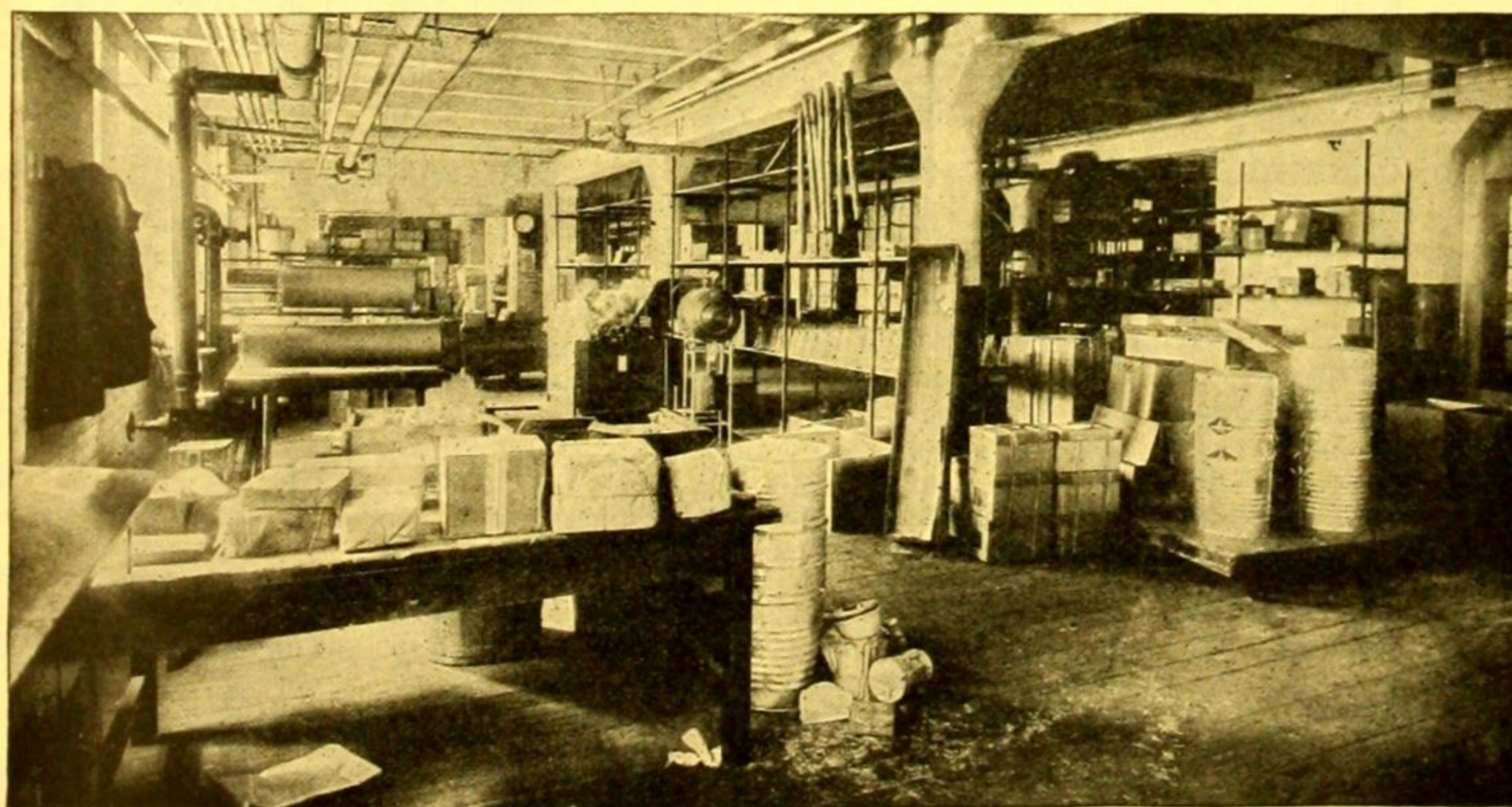
F2617. **COMPASS, MAGNETIC.** Agate cap needle, brass case, brass dial, 2° divisions, beveled glass, with cover. Diameter, 40 mm. 1.20

F2619. **COMPASS, MAGNETIC.** Agate cap needle. A low priced but high-grade compass, with dial of enameled card graduated in 5° divisions. The needle is of special steel, heavily magnetized. The case is brass, gunmetal finish, and has a diameter of 38 mm and a thickness of 16 mm. A heavy beveled glass serves as a cover, making the whole practically dust and water-tight 1.00

F2621. **COMPASS, MAGNETIC.** Agate cap needle, 37 mm aluminum pointer and stop for needle. Brass case, raised metal dial with 2° divisions. Especially useful in building galvanoscopes, tangent galvanometers, etc. Diameter, 50 mm. 1.50

F2625. **COMPASS, SIGHT,** watch case form, 50 mm diameter, with raised dial and full circle divisions. Bar needle 30 mm long, with agate cap. Sights and slip cover 6.75

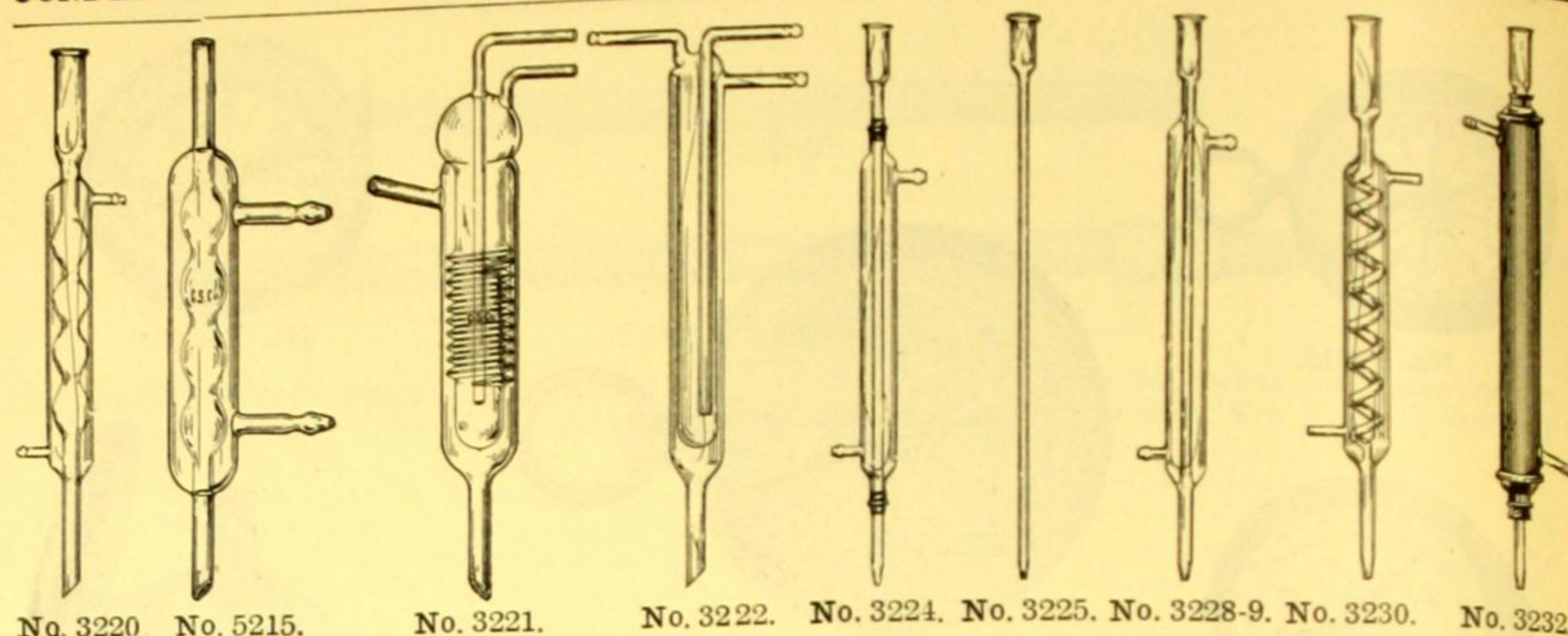
COMPRESSION PUMPS, see Blowers; Pumps, Air.



Our Receiving Room, where New Goods are Inspected and Packed for Stock.

CONDENSERS

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 3220 No. 5215. No. 3221. No. 3222. No. 3224. No. 3225. No. 3228-9. No. 3230. No. 3232.

CONDENSERS

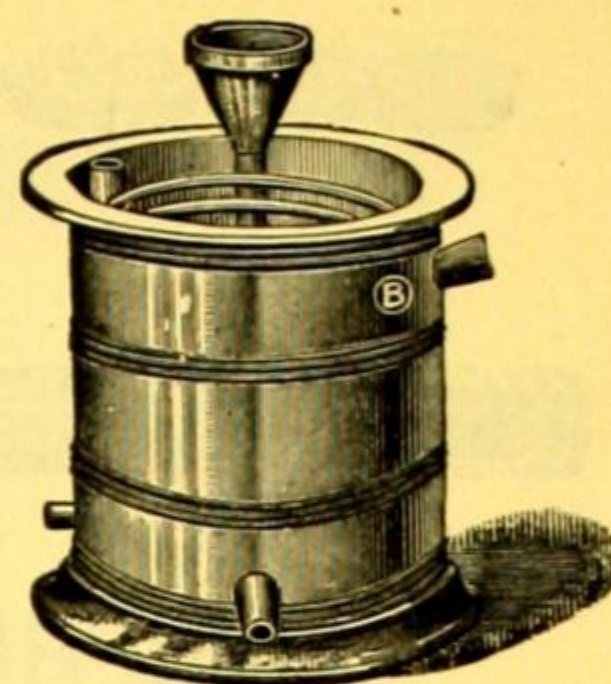
3220. **CONDENSERS, Allihn's**, of glass with bulb condensing tube, with adapter sealed on.
- | | | | | |
|---------------------------------|--------|------|------|------|
| Length of water jacket, mm..... | 200 | 300 | 400 | 600 |
| Length over all, mm..... | 400 | 500 | 600 | 815 |
| Number of bulbs | 4 | 6 | 7 | 12 |
| Each. | \$1.60 | 1.75 | 2.20 | 3.60 |
- 10% discount in lots of 12.
5215. **CONDENSERS, Allihn's**, reflux type, as used with No. 5212 Soxhlet Extraction Apparatus.
- | | | |
|---------------------------------|------|------|
| No. | B | C |
| Length of water jacket, mm..... | 200 | 250 |
| Length over all, mm..... | 400 | 450 |
| Each | 1.40 | 1.50 |
- 10% discount in lots of 12.
3221. **CONDENSER, Friedrich's Screw Type**, for either reflux or distillation purposes. This is the most efficient type of condenser for its size yet devised, since the escaping vapors must traverse the ten turns of the continuous spiral in contact with both the outer air cooled wall and the inner water cooled condenser jacket. Length over all, 200 mm; diameter of jacket, 40 mm..... 6.00
3222. **CONDENSER, Hopkins Reflux**, with inner jacket 250 mm long. Excellent for quick condensation, as the cold water jacket in the center offers a large condensing surface to the vapor. Length of outside jacket, 275 mm; total length, 380 mm. (See Journal of the American Chemical Society, for December, 1908)..... 3.60
3224. **CONDENSERS, Liebig's**, of glass with rubber connections and adapter.
- | | | | | | | |
|-----------------------------------|-----|------|------|------|------|------|
| No. | A | B | C | D | E | F |
| Length of water jacket, mm..... | 250 | 300 | 400 | 500 | 600 | 750 |
| Length of condenser tube, mm..... | 550 | 575 | 675 | 775 | 875 | 1025 |
| Each | .90 | 1.10 | 1.30 | 1.60 | 1.90 | 2.40 |
3225. **CONDENSER TUBES** only for No. 3224, 1/2 inch in diameter. May also be used for No. 3232.
- | | | | | | | |
|-------------------------------|-----|-----|-----|-----|-----|------|
| Length, mm | 550 | 575 | 675 | 775 | 875 | 1025 |
| For condenser jacket, mm..... | 250 | 300 | 400 | 500 | 600 | 750 |
| Each | .30 | .40 | .45 | .55 | .65 | .90 |
3228. **CONDENSERS, Liebig's**, all of glass with inner tube permanently sealed to jacket, with adapter.
- | | | | | | |
|---------------------------------|------|------|------|------|------|
| Length of water jacket, mm..... | 250 | 300 | 400 | 500 | 600 |
| Length over all, mm..... | 450 | 500 | 600 | 730 | 830 |
| Each | 1.00 | 1.20 | 1.50 | 1.80 | 2.20 |
- 10% discount in lots of 12 on Nos. 3222 to 3228 inclusive.
3229. **CONDENSERS, Liebig's, Pyrex**, same as No. 3228, but of Pyrex glass.
- | | | | | |
|----------------------------------|------|------|------|------|
| Length of water jacket, mm | 250 | 300 | 500 | 600 |
| Length over all, mm..... | 450 | 500 | 700 | 800 |
| Each | 2.80 | 3.20 | 4.40 | 4.80 |
3230. **CONDENSERS, Liebig's**, of glass, with coiled condenser tube sealed in water jacket, with adapter sealed on.
- | | | | | |
|---------------------------------|------|------|------|------|
| Length of water jacket, mm..... | 200 | 300 | 400 | 600 |
| Length over all, mm..... | 400 | 500 | 600 | 830 |
| Each | 1.80 | 2.00 | 2.50 | 5.00 |
- 10% discount in lots of 12.
3232. **CONDENSERS, Liebig's**, of polished brass, 47 mm in diameter, fitted with glass condensing tube and rubber connections.
- | | | |
|---------------------------------|------|------|
| Length of brass jacket, mm..... | 375 | 500 |
| Length over all, mm..... | 625 | 750 |
| Each | 4.50 | 5.00 |



No. 3234.

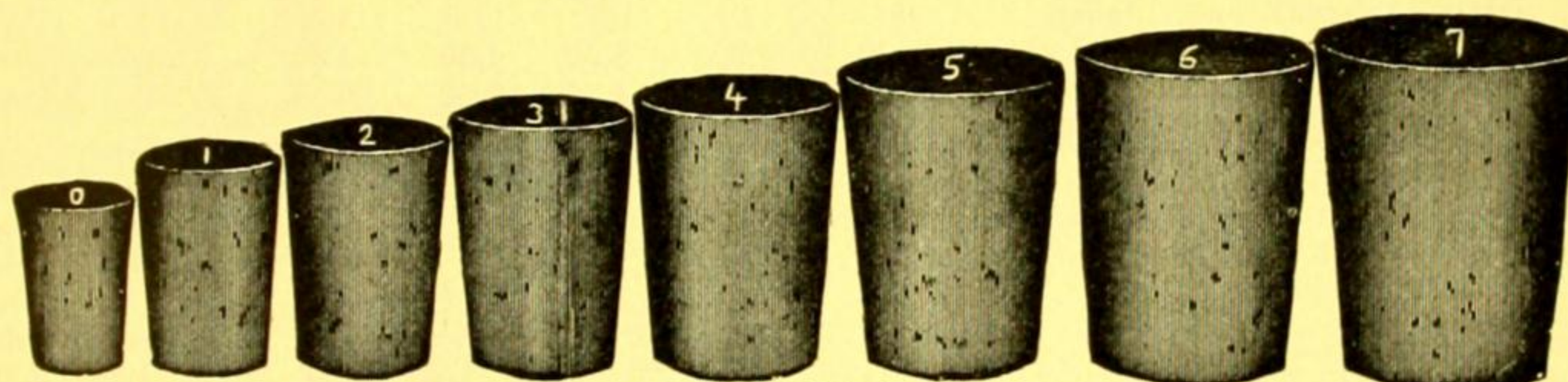


No. 3238.



No. 3240.

3234. **CONDENSER, Soxhlet's Spherical**, of copper, tinned inside and nickel-plated; diameter, 100 mm. \$4.25
3238. **CONDENSER, Sulphurous Acid, Liebig's**, with two glass stop-cocks on horizontal tubes. 2.50
3240. **CONDENSERS, Zinc**, with heavy block tin worm, for use with Distilling Apparatus No. 4148.
- | No. | A | B | C | D | E |
|-------------------------------|-------|------|--------|--------|--------|
| For still, capacity, gallons. | 1/2 | 1 | 2 | 3 | 5 |
| Height over all, inches. | 6 3/8 | 7 | 10 1/4 | 14 3/8 | 15 5/8 |
| Diameter outside, inches. | 5 3/8 | 7 | 8 1/4 | 9 3/4 | 12 5/8 |
| Diameter of tin tube, inches. | 3/8 | 3/8 | 3/8 | 1/2 | 5/8 |
| Each | 6.50 | 7.60 | 9.40 | 13.00 | 15.40 |
3242. **CORD, Chalk Line, Masons'**, 1/16 inch; in hanks of 20 feet Per hank .08
3244. **CORD, Fish Line, Silk**, braided, 25 yards on card Per card .40
3245. **CORD, Twisted Flax**, fine quality, in 1/2-lb. balls. Per ball 1.00



Nos. 3246-56.

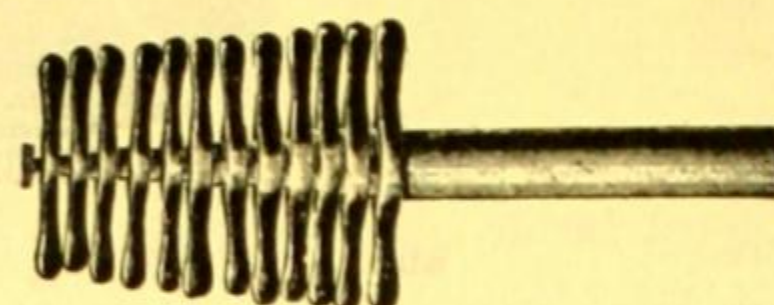
3246. **CORKS, XX Quality**, regular length.
- | No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------------|--------|-----|------|-----|------|------|------|------|------|------|------|
| Diam. at small end, inches. | 3/32 | 1/8 | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 5/8 | 3/4 | 7/8 |
| Per 10 | \$0.05 | .05 | .05 | .05 | .06 | .07 | .08 | .08 | .10 | .12 | .13 |
| Per 100 | .22 | .22 | .25 | .25 | .30 | .34 | .37 | .40 | .50 | .60 | .62 |
| Per 500 | .85 | .85 | .90 | .95 | 1.20 | 1.35 | 1.50 | 1.65 | 1.90 | 2.45 | 2.50 |
3250. **CORKS, XXXX Quality**, regular length, far superior for laboratory work to the XX or XXX quality in soundness and freedom from holes.
- | No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------------|------|------|------|------|------|------|------|------|------|------|
| Diam. at small end, inches. | 1/8 | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 5/8 | 3/4 | 7/8 |
| Per 10 | .08 | .09 | .10 | .12 | .15 | .17 | .20 | .25 | .30 | .32 |
| Per 100 | .37 | .47 | .52 | .62 | .75 | .85 | 1.05 | 1.30 | 1.55 | 1.60 |
| Per 500 | 1.50 | 1.90 | 2.10 | 2.50 | 3.00 | 3.40 | 4.30 | 5.15 | 6.30 | 6.50 |
3252. **CORKS, XX Quality**, Nos. 0 to 11 assorted, in gross packages only. Per gross .55
3253. **CORKS, XX Quality**, Nos. 12 to 26 assorted, in gross packages only. Per gross 2.25



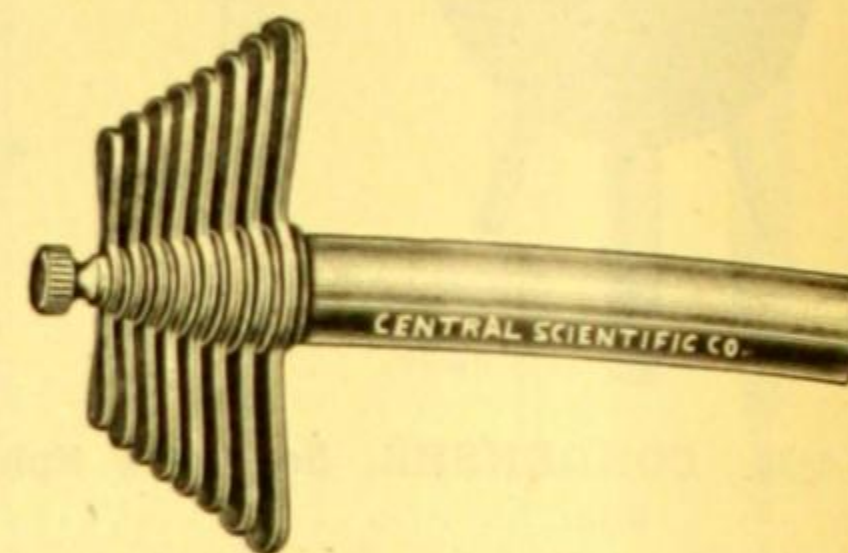
No. 3258.



No. 3266.



No. 3270.



No. 3268.

3256. **CORKS, Selected Grade**, regular length, finest quality, for use in chemical laboratories. An especially light cork, practically free from holes, specially recommended for use in laboratories where distillations and extractions are made with volatile liquids.

These distinctions and extractions are made with volatile liquids.								
No.	1	2	3	4	5			
Diam. at small end, inches.....	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$			
Per 100	\$0.40	.50	.60	.70	.90			
Per bag of 500.....	1.60	2.00	2.40	2.80	3.60			
No.	6	7	8	9	10	11	12	
Diam. at small end, inches.....	$\frac{1}{8}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{8}$	
Per 100	1.00	1.20	1.45	1.90	2.05	2.30	2.50	
Per bag of 500.....	4.00	4.80	5.80	7.60	8.20	9.20	10.00	
No.	13	14	15	16	17	18	19	20
Diam. at small end, inches....	$\frac{1}{8}$	1	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$1\frac{7}{8}$	$1\frac{3}{4}$	$1\frac{1}{2}$
Per 100	2.80	3.20	3.60	4.50	4.85	5.20	5.60	6.00
Per bag of 500.....	11.60	12.80	14.40	18.00	19.40	20.80	22.40	24.00

3258. **CORKS, Flat Specie Corks, XX Quality**, with slight taper; for wide mouth bottles.

No.	A	B	C	D	E	F	G	H	J
Diameter at large end, inches.....	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$
Diameter at small end, inches.....	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Length, inches	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$
Per 10	.18	.18	.20	.25	.26	.35	.36	.40	.50
Per 100	.95	.95	1.05	1.25	1.27	1.75	1.80	2.20	2.60
Per 500	3.85	3.85	4.20	5.00	5.10	7.00	7.25	8.80	10.40
No.	K	L	M	N	P	Q	R	S	
Diameter at large end, inches.....	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	
Diameter at small end, inches.....	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	
Length, inches	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	
Per 10	.55	.65	.70	.80	.90	1.10	1.15	1.45	
Per 100	2.90	3.35	3.65	4.40	4.60	5.50	5.80	7.25	
Per 500	11.70	13.50	14.70	17.60	18.50	22.30	23.50	29.00	

3264. **CORK BORER**, hard brass, smallest size, $\frac{3}{16}$ inch, with punch..... .40

3266. **CORK BORERS**, hard brass, in sets, with punch for each set.

No.	A	B	C	D	E
Number in set.....	3	6	9	12	15
Diameter of borers, inches.....	$\frac{3}{16}$ - $\frac{5}{16}$	$\frac{3}{16}$ - $\frac{7}{16}$	$\frac{3}{16}$ - $\frac{5}{8}$	$\frac{3}{16}$ - $\frac{3}{4}$	$\frac{3}{16}$ - $\frac{7}{8}$
Per set	.50	1.00	1.75	2.60	3.50

10% discount in lots of 10, 20% discount in lots of 100.

3268. **CORK BORERS**, of hard brass, in sets, with individual handles, and punch for each set.

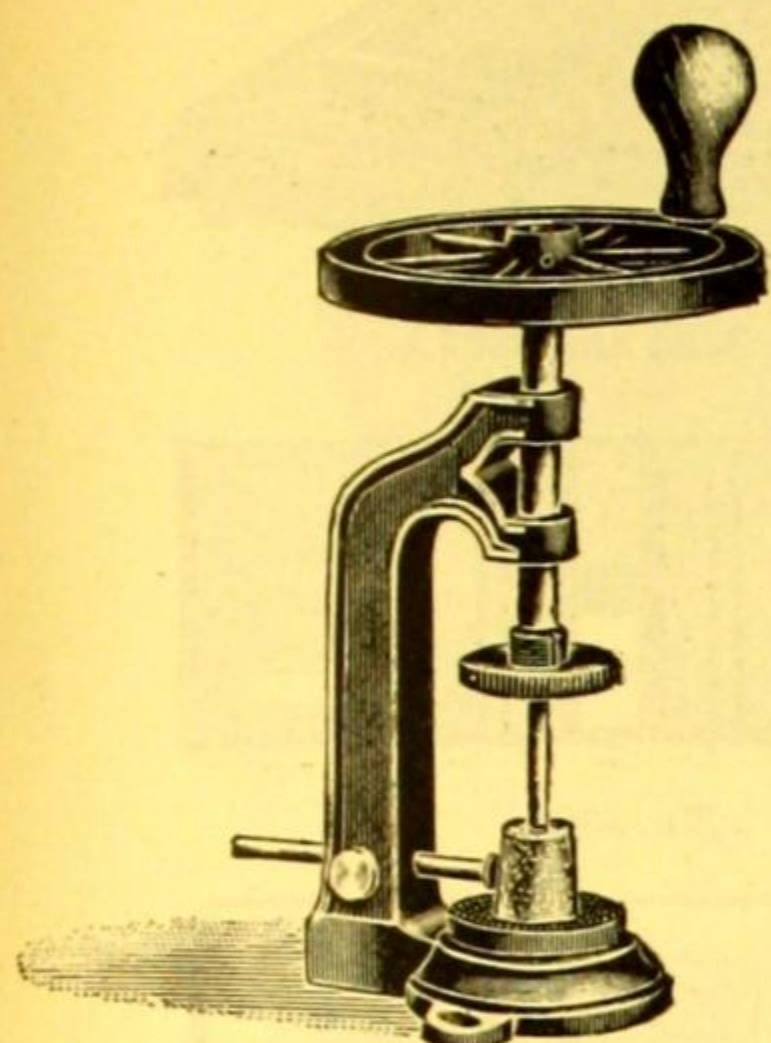
No.	B	C	D	E
Number in set.....	6	9	12	15
Diameter of borers, inches.....	$\frac{3}{16}$ - $\frac{7}{16}$	$\frac{3}{16}$ - $\frac{5}{8}$	$\frac{3}{16}$ - $\frac{3}{4}$	$\frac{3}{16}$ - $\frac{7}{8}$
Per set	1.20	2.00	3.20	4.10

10% discount in lots of 10, 20% discount in lots of 100.

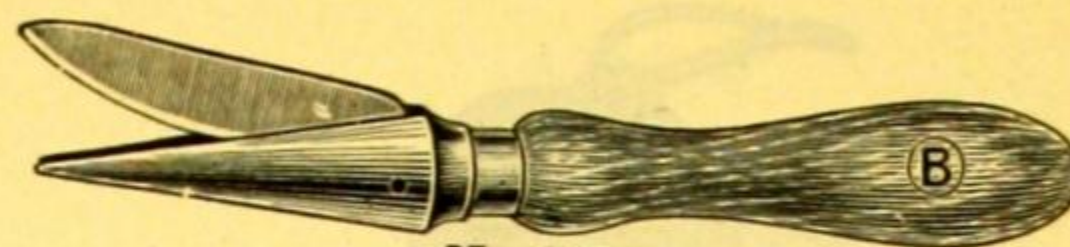
3270. **CORK BORERS**, of steel tubing, in sets, with individual handles, and punch for each set. Borers differ by $\frac{1}{16}$ inch in diameter.

No.	A	B	C
Number in set.....	3	6	8
Diameter of borers, inches.....	$\frac{1}{8}$ - $\frac{1}{4}$	$\frac{1}{8}$ - $\frac{7}{16}$	$\frac{1}{8}$ - $\frac{9}{16}$
Per set.....	.85	1.60	1.80

10% discount in lots of 10, 20% discount in lots of 100.



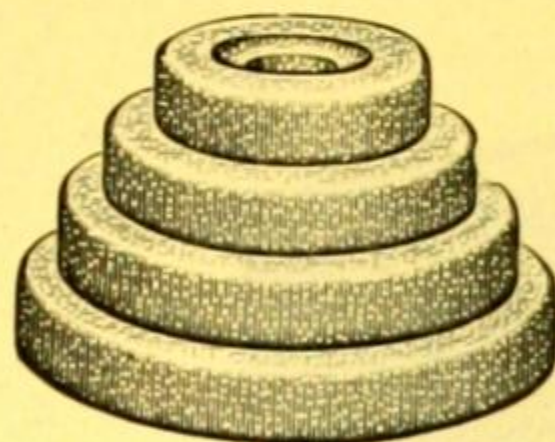
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No. 3274.



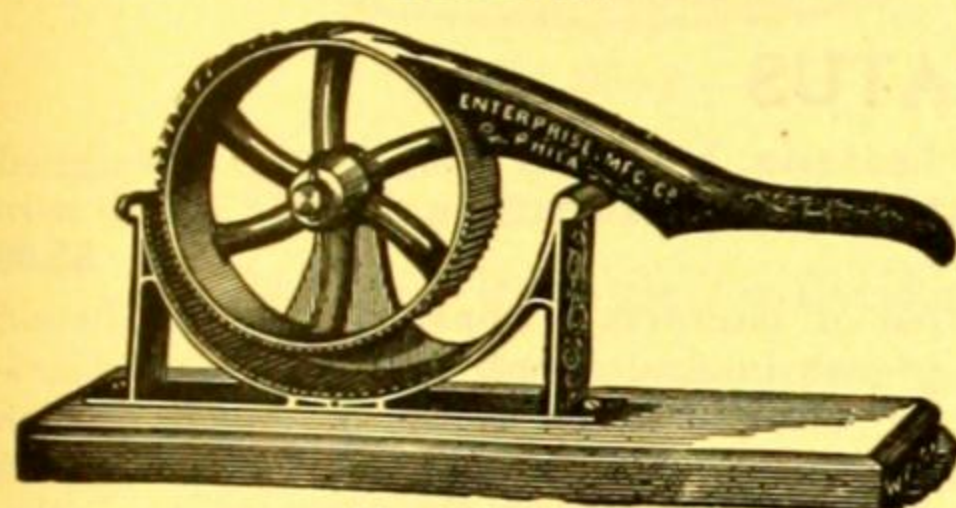
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No. 3296.



No. 8146.



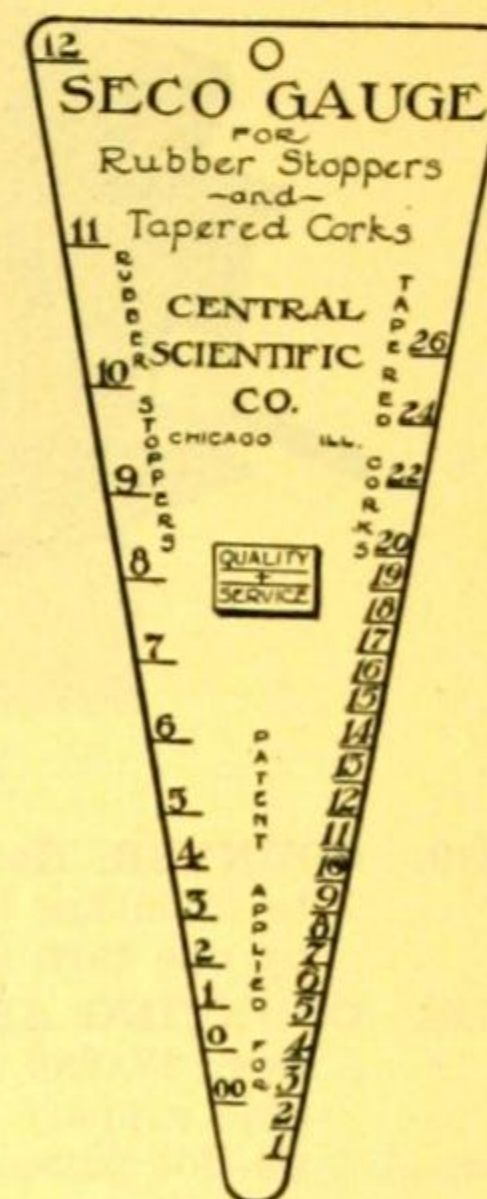
No. 3292B.



No. 3304.

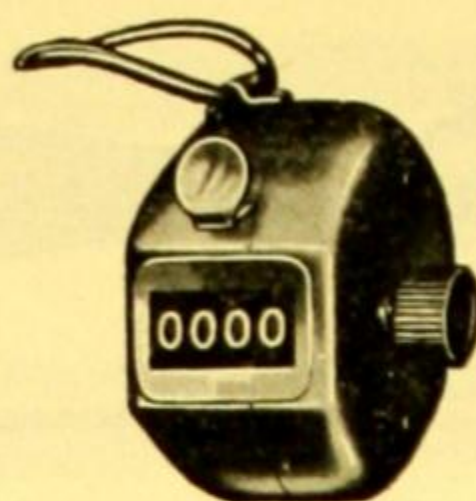


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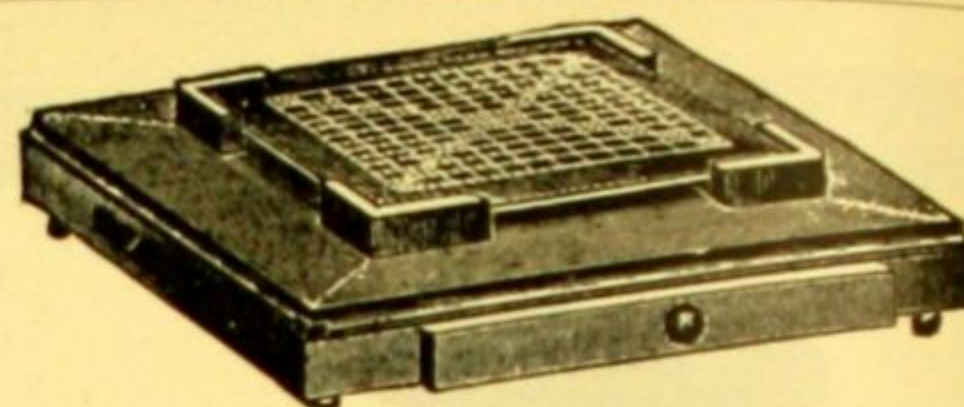


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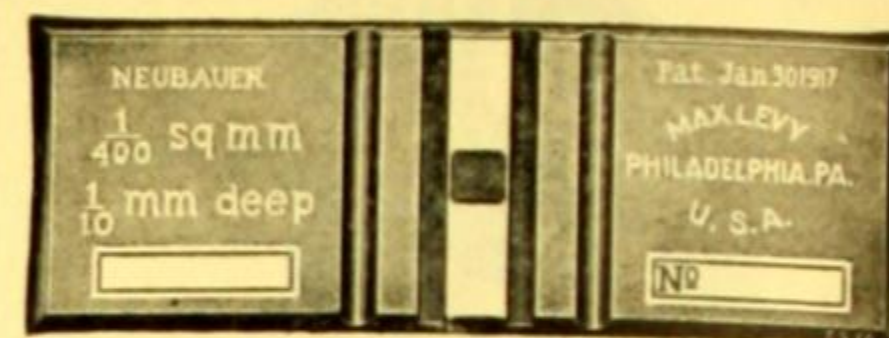
3272. **CORK BORING MACHINE.** Can be screwed firmly to table. With this machine it is possible to drill rapidly both rubber and cork stoppers. Complete with 8 interchangeable steel drills of from $\frac{3}{16}$ to $\frac{5}{8}$ inch diameter..... \$22.50
3274. **CORK BORER SHARPENER,** steel cone with knife 1.60
3278. **CORK EXTRACTOR,** for use when corks have been pushed inside bottle..... .20
3280. **CORK GAGE,** of aluminum, for use in determining the proper size of cork or rubber stoppers for bottles, flasks, etc. For rubber stoppers from 00 to 12 and cork stoppers from 1 to 26.. .15
8146. **CORK KNIFE,** with good quality steel blade 4 inches long, and round wood handle..... .25
- 3292B. **CORK PRESS,** rotary form, for corks up to $1\frac{1}{4}$ inches..... 1.85
3296. **CORK RINGS,** Suberite, of compressed cork, for supporting flasks, etc. Highly recommended as a substitute for straw rings on account of their appearance and durability.
- | | | | | | |
|--------------------------|-----|-----|-----|-----|-----|
| Diameter inside, mm..... | 30 | 60 | 90 | 120 | 150 |
| Each | .30 | .50 | .70 | .80 | .90 |
3300. **CORK SHEETS, XX Quality,** size 4x12 inches.
- | | | |
|-------------------------|---------------|----------------|
| Thickness, inches | $\frac{1}{8}$ | $\frac{3}{16}$ |
| Each | .18 | .27 |
| Per dozen | 1.80 | 2.70 |
3304. **CORKSCREW,** with ring handle and shield..... .20
3306. **CORKSCREW,** self-pulling80



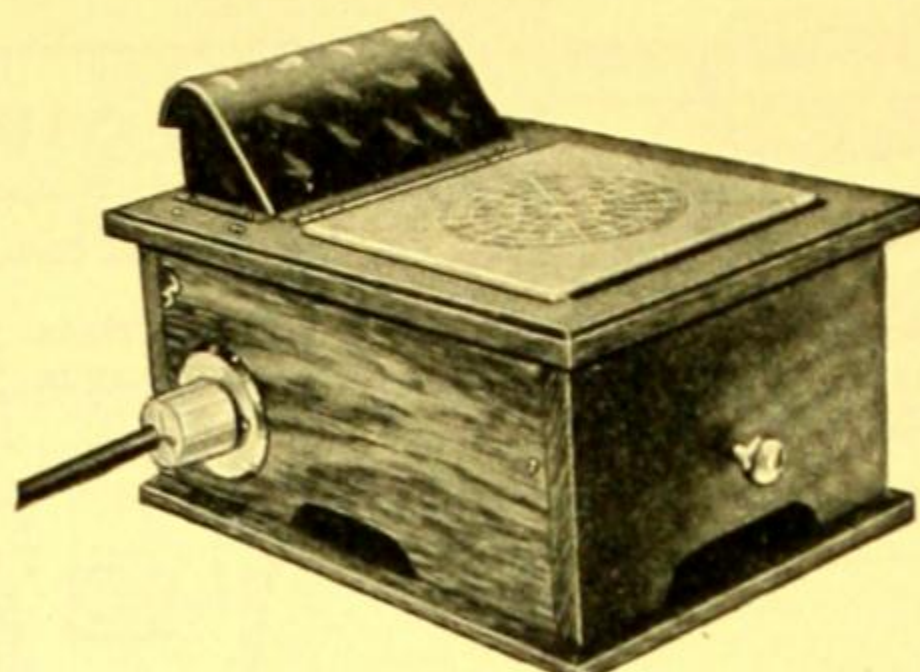
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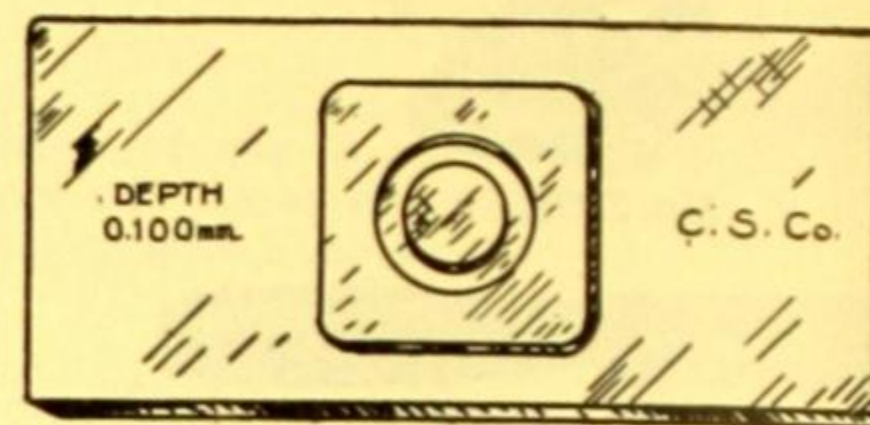
Nos. 3324 and 3324A.



No. 3326.



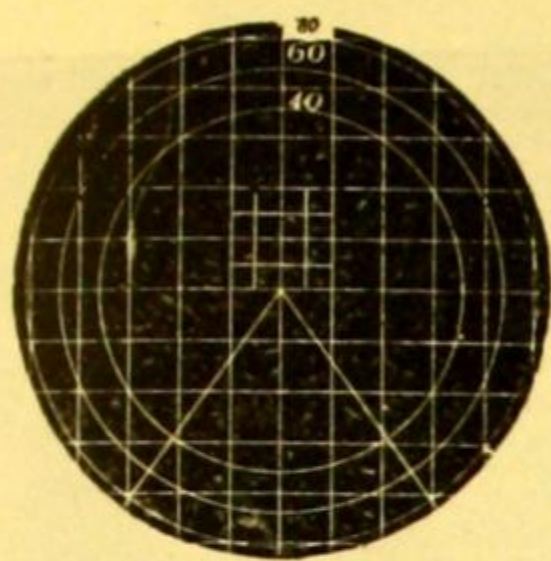
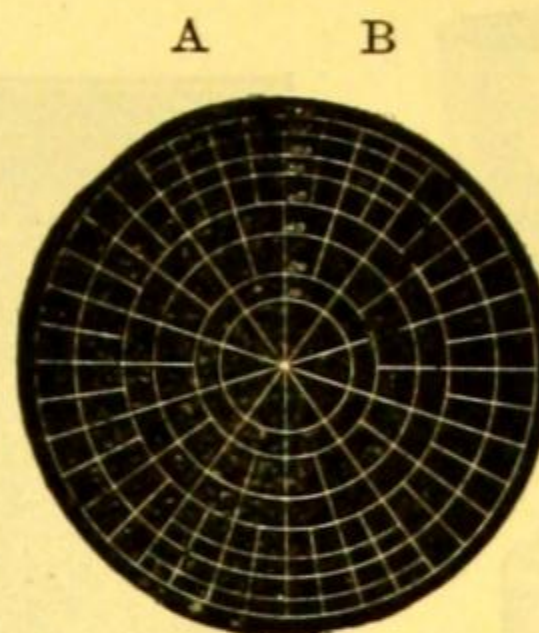
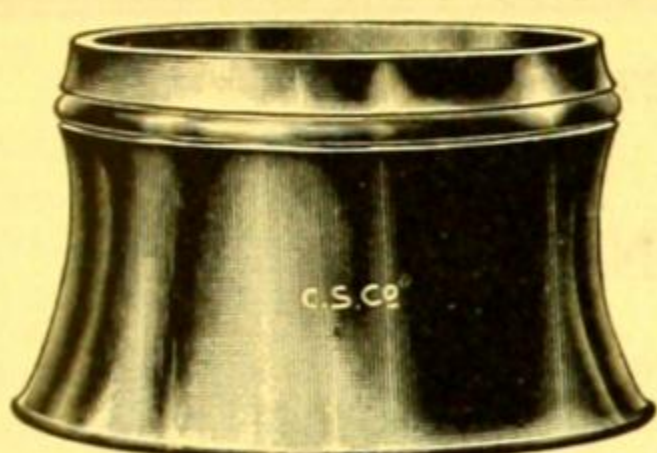
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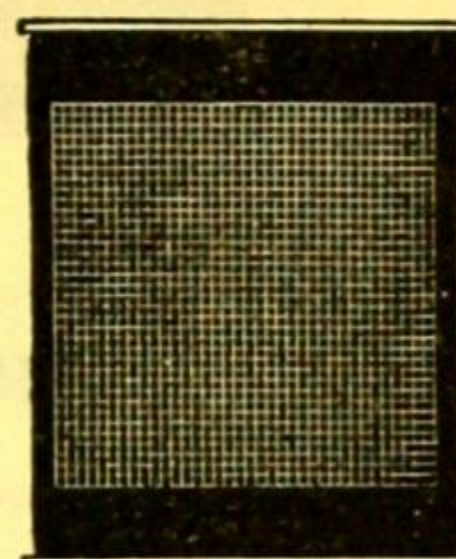
No. 3327.

COUNTING APPARATUS

3319. **COUNTER, Hand Tally**, for use in counting colonies of bacteria, blood corpuscles, etc. Designed to fit either hand without discomfort, as all corners are rounded. It can be quickly set to zero by one turn of the knob. \$5.00
3320. **COUNTING APPARATUS, Stewart**, for counting colonies of bacteria. Consists of a hardwood box, 12x8x6 inches, in which is placed a 16-candle power incandescent lamp and an adjustable support for carrying the Petri dish, illuminated by oblique rays from the lamp, which do not pass into the eyes of the operator. A ruled glass plate is provided on top of the box and the count is made by viewing the colonies on the Petri dish through the glass plate. (See Journal of Medical Research for January, 1906) 20.00
3321. **Reading Lens** for use with No. 3320. 3.00
3322. **Ruled Counting Plate** only of No. 3320. 6.00
3324. **COUNTING APPARATUS, Wolffhuegel**, for counting colonies of bacteria. Consists of hardwood base with drawer furnished with one black and one white background above which the ruled glass plate is held by four corner supports. The ruled glass plate is 165 mm square with a ruled area 120 mm square. 9.00
- 3324A. **COUNTING APPARATUS, Jeffer**, for counting colonies of bacteria. Similar to No. 3324, but with Jeffer ruled glass plate. The ruled glass plate is 165 mm square with a circular ruled area 132 mm in diameter. This area is divided by concentric circles into equal areas, which are subdivided by radii or segments of radii into smaller integral portions. The numbers refer to the number of equal sections within the area enclosed between the three outer circles which are further subdivided into half-spaces. (See Journal of Applied Microscopy and Laboratory Methods, Vol. I, No. 3.) Complete on hardwood base with drawer and one each black and white background 11.00
3325. **Ruled Glass Plates**, 165 mm square, for Nos. 3324 and 3324A.
- | No. | Type of ruling | A | B |
|------|----------------|------|------|
| Each | Wolffhuegel | 1.70 | 3.60 |
- For Counting Apparatus for Frost's Little Plate Method of counting bacteria in milk, see Milk Testing.
3326. **COUNTING CHAMBER, Helber**, for standardization of bacterial vaccines by the counting method. Consists of a single Neubauer ruling on a haemocytometer chamber of the same construction as No. 1249, but 0.2 mm deep instead of the usual 0.1 mm. A reinforced cover glass of .18 mm thickness is supplied with the chamber for use when a homogeneous immersion objective is used. Without case. 14.00
3327. **COUNTING CHAMBER, Howard**, for molds, yeasts, etc. Consists of a heavy glass slide upon which a square plate of glass with a circular opening is mounted. Within the circular opening, a circular disk of glass 18 mm in diameter is mounted with its top surface exactly 0.1 mm below the surface of the larger plate surrounding it. The central disk is unruled. Complete with one planoparallel cover glass 0.6 mm thick and one 1.0 mm thick. Without case. 5.50
- 3327A. **Cover Glasses**, only, for No. 3327, 33 mm square.
- | Thickness, mm | Each |
|---------------|------|
| 0.6 | 1.0 |
| 1.0 | 1.00 |

A B
No. 3328.A B
No. 3330.

No. 8344.



No. 3340.

For Counting Chambers for Blood Counts, see Nos. 1248 to 1259.

For Counting Chamber for Cytological Investigations, see No. 1246.

For Counting Dishes with Ruled Bottoms, see No. 3596.

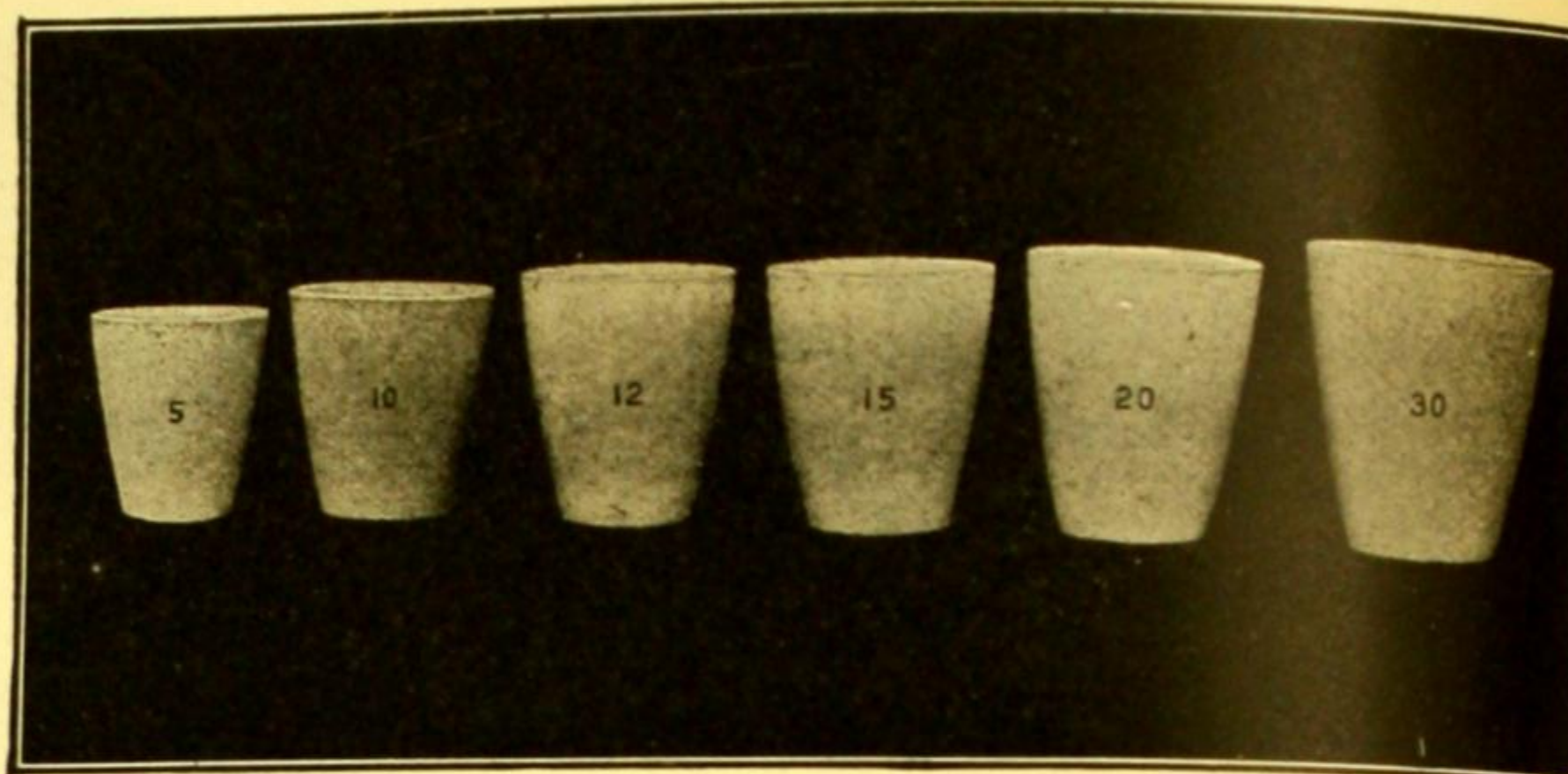
3328. **COUNTING PLATE, Frost's**, printed in black with white lines, on good quality Bristol board. The cross lines divide the figure into square centimeters. Four of these, just above the center, are subdivided. The numbers 40, 60 and 80, give the area of the disks bounded by the circles just below them. The area of each sector, a and b, is one-tenth of the area enclosed by its circle \$0.10
20% discount in lots of 12.
3330. **COUNTING PLATE, Jeffer**, similar to No. 3328, but with Jeffer's ruling as described under No. 3324A each .10
20% discount in lots of 12.
8344. **COUNTING GLASS**, for use in counting colonies of bacteria in the Koch method for water and milk. This glass meets the specifications of the American Public Health Association. Magnification, $3\frac{1}{2}x$. (See Standard Methods of Bacteriological Analysis of Water and Milk, of the A. P. H. A.) 4.00
3340. **CROSS SECTION CHART**, made of extra quality blackboard cloth, with lines in white, accurately spaced and permanent. Its surface takes crayon marks and permits their erasure as easily as a blackboard. Can be rolled up when not in use. Size of ruled surface, 36x36 in. 4.50
3344. **CROSS SECTION PAPER**, one millimeter divisions with heavy centimeter ruling. In sheets 17x17 cm, on transparent onion skin paper Per quire .50
3346. **CROSS SECTION PAPER**, accurately ruled, printed from an engraved plate. One millimeter divisions with heavier centimeter ruling; size 40x50 cm. Per sheet .18
Per quire 3.50
3347. **CROSS SECTION PAPER**, same as No. 3346, continuous ruling in one millimeter divisions, 50 cm wide Per yard .30
3350. **CROSS SECTION PAPER**, ruled in $\frac{1}{10}$ th inch divisions, size 16x21 inches. Per sheet .10
Per quire 2.00
- F8805. **CROSS SECTION TABLET**, containing 60 sheets of paper metrically ruled with heavy lines every cm and light lines every 2 mm, with note ruling and marginal line on opposite side. each .22
Per dozen 2.10
3354. **POLAR CO-ORDINATE PAPER**, printed from an engine divided plate, about 17 cm in diameter. Per quire .60



No. 3360.
No. 3366.



Nos. 3368-70.



No. 3372.

CRUCIBLES, ALL KINDS

3360. **CRUCIBLES, Alundum**, for general laboratory use. These crucibles will stand any temperature available in the laboratory, and this with their high thermal conductivity, makes them valuable for coal analysis, drying materials, igniting filters, etc. Furnished in fine mixtures only.

No.	A	B	C	D	E
Capacity, cc.	10	20	25	30	40
Diameter, inches	1 $\frac{1}{16}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{7}{8}$
Height, inches	1 $\frac{3}{32}$	1 $\frac{3}{16}$	1 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{5}{8}$
Each	\$0.35	.35	.35	.40	.40

3361. **COVERS, Alundum**, for No. 3360 Crucibles.

No.	B	E
For crucibles, cc.	20	40
Each	.30	.35

CRUCIBLES, Alundum Filtering, for rapid filtration; save 75 per cent. of the time usually required. Not affected by solutions of acids or alkalis and can readily be dried to constant weight. Recommended by Spencer for use in sugar analysis.

No.	A	B
Capacity, cc.	25	35
Diameter, inches	1 $\frac{3}{8}$	1 $\frac{5}{8}$
Height, inches	1 $\frac{1}{2}$	1 $\frac{11}{16}$

3366. Each, medium porosity (RA 360) .35 .40
3367. Each, coarse porosity (RA 98) .35 .40

3368. **CRUCIBLES, Alundum Melting**, highly refractory, and well adapted to experimental electric furnace work. They are not suited for use where slags are encountered on account of their absorbent nature. Furnished in fine mixtures only. Price of No. 3368C includes cover.

No.	A	B	C
Diameter, inches	1 $\frac{1}{2}$	2 $\frac{3}{8}$	2 $\frac{3}{4}$
Height, inches	2	2 $\frac{5}{8}$	4 $\frac{3}{4}$
Each	.75	1.25	2.00

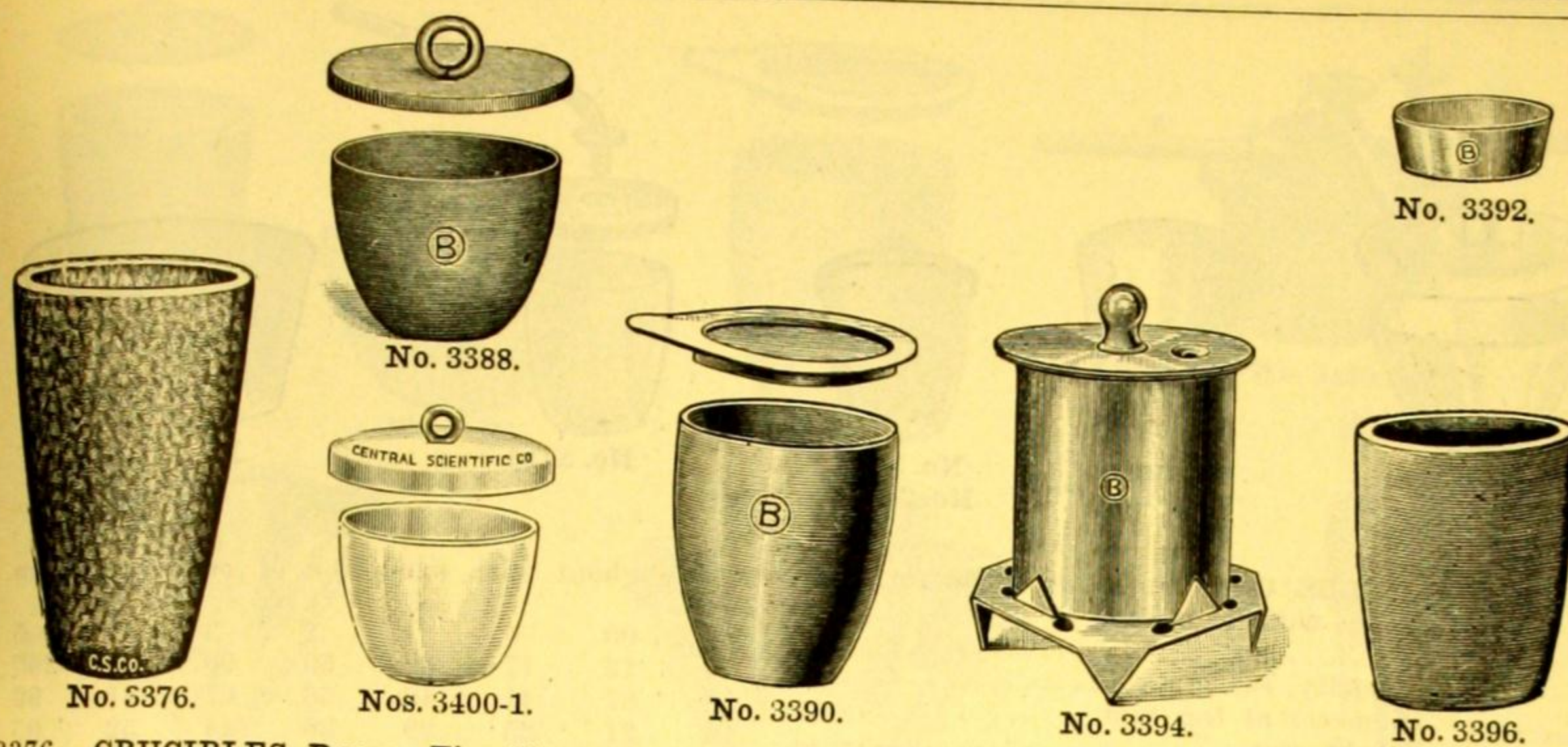
3370. **CRUCIBLE, Alundum Melting**, similar to No. 3368, but of composition especially adapted for work requiring an extremely refractory body. Platinum has been melted in this crucible. Diameter, 1 $\frac{3}{8}$ inches; height, 3 $\frac{1}{4}$ inches. 2.00

3372. **CRUCIBLES, Denver Fire Clay**, for assay work; without covers.

No.	A	B	C	D	E
Capacity, grams	5	10	15	20	30
Height, inches	2 $\frac{5}{8}$	3	3 $\frac{1}{2}$	3 $\frac{3}{4}$	3 $\frac{7}{8}$
Diam. at top, inches	2 $\frac{3}{8}$	2 $\frac{5}{8}$	2 $\frac{7}{8}$	3 $\frac{1}{8}$	3 $\frac{1}{2}$
Per dozen	.85	.90	1.15	1.20	1.50
20% discount in original barrel containing..	850	500	400	350	250

3373. **COVERS** for No. 3372.

No.	A	B	C	D	E
Per dozen	.60	.60	.75	.95	1.40

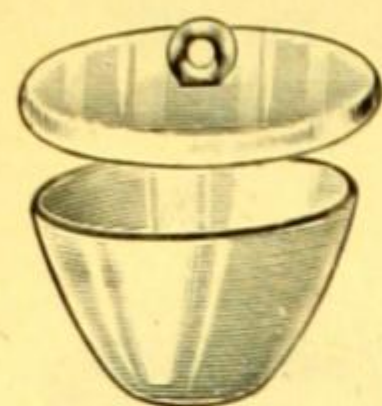


3376. **CRUCIBLES**, Denver Fire Clay, high form, for gasoline or open furnace work; without covers.
- | No. | D | E | F | G | J | K | L |
|--|--------|------|------|------|------|------|------|
| Height, inches | 4 | 4½ | 5 | 5½ | 6½ | 7½ | 8 |
| Diam. at top, inches | 2¾ | 3 | 3½ | 3¾ | 4¾ | 5¼ | 5½ |
| Per dozen | \$1.10 | 1.65 | 2.00 | 2.50 | 4.30 | 5.75 | 8.00 |
| 20% discount in original barrel containing | 450 | 300 | 225 | 140 | 75 | 50 | 40 |
3388. **CRUCIBLES**, Wrought Iron, light, with covers.
- | No. | A | B | C | D |
|------------------|-----|-----|-----|-----|
| Capacity, cc | 20 | 50 | 100 | 200 |
| Diameter, inches | 1½ | 2½ | 2½ | 3½ |
| Height, inches | 1¼ | 1½ | 2 | 2¾ |
| Each | .20 | .25 | .30 | .40 |
- 10% discount in lots of 12.
3390. **CRUCIBLES**, Nickel, spun from pure sheet nickel, with covers.
- | No. | A | B | C | D | E |
|------------------|-----|------|------|------|------|
| Capacity, cc | 20 | 30 | 50 | 100 | 250 |
| Diameter, inches | 1½ | 1½ | 1¾ | 2¾ | 3¼ |
| Height, inches | 1¾ | 1¾ | 2 | 2½ | 3¼ |
| Each | .90 | 1.00 | 1.20 | 1.50 | 2.30 |
- 10% discount in lots of 12.
3392. **CRUCIBLE**, Nickel, Kawin's, of heavy pure nickel, for use in muffle furnaces for burning off filter paper in silica determinations in iron. Diameter, 28 mm; height, 15 mm. .40
- 10% discount in lots of 12.
3394. **CRUCIBLE**, Nickel, Pennock and Martin's, for the rapid and accurate determination of sulphur in coal and coke; consists of a pure nickel crucible of 40 cc capacity, with perforated lid for insertion of ignition wire, mounted upon an aluminum base. Diameter of crucible, 1½ inches; height, 1¾ inches. (See Journal of the American Chemical Society, for December 1903, page 1265) 3.00
- For **CRUCIBLES**, Platinum, see Platinum Ware.
3396. **CRUCIBLES**, Plumbago or Black Lead, Dixon's, without covers.
- | No. | 0 | 00 | 000 | 0000 | 1 | 2 | 3 |
|-------------------------------|--------|-----|-----|------|-----|-----|------|
| Capacity about, fluid ounces | 1½ | 2 | 3 | 4 | 8 | 12 | 16 |
| Height outside, inches | 2 | 2¼ | 2½ | 2½ | 3½ | 4½ | 5¼ |
| Diam. at top, outside, inches | 1½ | 1½ | 1½ | 2¾ | 3¼ | 3½ | 4¼ |
| Each | \$0.65 | .65 | .65 | .65 | .80 | .90 | 1.10 |
3397. **Covers** for No. 3396.
- | No. | 0 | 00 | 000 | 0000 | 1 | 2 | 3 |
|----------------------|-----|-----|-----|------|-----|-----|-----|
| To fit Crucible, No. | 0 | 00 | 000 | 0000 | 1 | 2 | 3 |
| Each | .30 | .30 | .30 | .30 | .42 | .42 | .42 |
3400. **CRUCIBLES**, Coors Porcelain, high form, glazed throughout with exception of outside bottom surface; without covers.
- | No. | 00 | 0 | 1 | 2 |
|---------------------|-----|-----|-----|-----|
| Capacity, cc | 10 | 15 | 30 | 57 |
| Diameter at top, mm | 30 | 35 | 41 | 52 |
| Height, mm | 25 | 27 | 35 | 43 |
| Each | .14 | .18 | .29 | .36 |
3401. **Covers** for Crucibles No. 3400.
- | No. | 00 | 0 | 1 | 2 |
|--------------|-----|-----|-----|-----|
| Diameter, mm | 35 | 42 | 47 | 59 |
| Each | .06 | .06 | .08 | .11 |

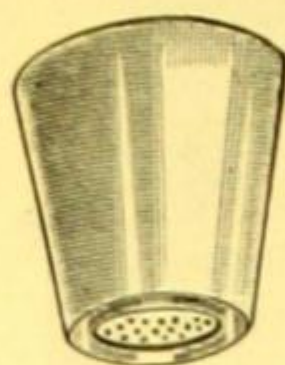
10% discount to commercial institutions, 15% discount to educational institutions on Nos. 3400-1 for orders amounting to \$100.00 or above.

CRUCIBLES

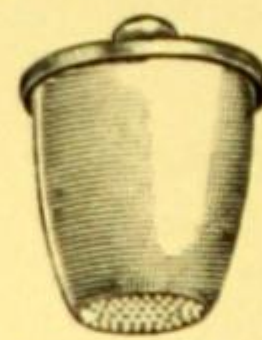
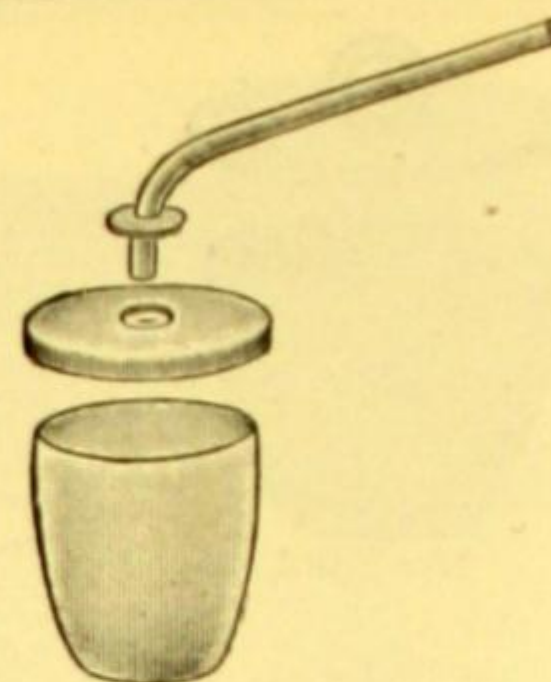
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



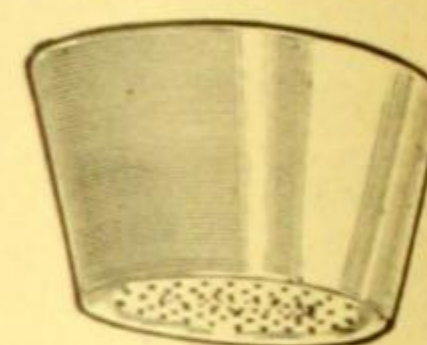
Nos. 3404-5.



No. 3408.

No. 3412.
No. 3424B.

No. 3416.



No. 3414.

3404. **CRUCIBLES, Coors Porcelain, wide form, glazed throughout with exception of outside bottom surface; without covers.**

	000	00	0	1	2	3	4	5
No.	8	12	17	30	50	90	145	265
Capacity, cc.	32	37	41	46	56	67	81	96
Diameter at top, mm.	19	21	25	29	36	44	52	65
Height, mm.	\$0.14	.18	.22	.30	.41	.52	.60	.74
Each								

3405. **Covers for Crucibles No. 3404.**

	000	00	0	1	2	3	4	5
No.	39	44	47	52	65	76	88	107
Diameter, mm.	.06	.06	.08	.08	.12	.14	.18	.22
Each								

3408. **CRUCIBLE, Caldwell's Form, Coors Porcelain, glazed throughout with exception of outside bottom surface, with removable perforated plate to fit in bottom. Size No. 3; capacity, 25 cc. Without cover**66

3409. **Cover only for No. 3408.**08

5366. **Perforated Disk only for No. 3408. Size No. 3; diameter, 22 mm.**24
Perforated Disks, Platinum, for No. 3408 Crucibles, see Platinum Ware.

3412. **CRUCIBLES, Gooch Form, Coors Porcelain, glazed throughout except outside bottom surface. Perforations about 1 mm in diameter. Without covers.**

	2	3	4
No.	10	25	35
Capacity, cc.	27	35	40
Diameter at top, mm.	18	22	25
Diameter at bottom, mm.	30	40	43
Height, mm.	.36	.48	.54
Each			

3413. **Covers for No. 3412.**

	35	42	47
Diameter, mm.	.06	.06	.08
Each			

3414. **CRUCIBLE, Gooch, for Bitumen in Asphalt, Coors Porcelain, with large filtering surface. Height, 24 mm; width at top, 45 mm; width at bottom, 35 mm. Capacity, 40 cc.**60

3416. **CRUCIBLES, Rose's, of unglazed porcelain, complete with perforated cover and delivery tube.**

	1	2
No.	15	30
Capacity, cc.	31	39
Diameter at top, mm.	37	43
Height, mm.	1.15	1.26
Each		

3417. **Covers, only of No. 3416.**

	1	2
No.	38	42
Diameter, mm.	.07	.08
Each		

3418. **Crucibles, only of No. 3416.**

	1	2
No.	.22	.32
Each		

3419. **Delivery Tubes, only, with flange, of No. 3416. Length, 140 by 30 mm.**

	1	2
No.	.86	.86
Each		

Note:—10% discount to commercial institutions, 15% discount to educational institutions on Nos. 3404 to 3419 for orders amounting to \$100.00 or above.

3424B. **CRUCIBLE, Transparent Quartz, Gooch Form, diameter at top, 35 mm; capacity, 20 cc; with 7 holes 2 mm in diameter in the bottom. Without covers** 5.63

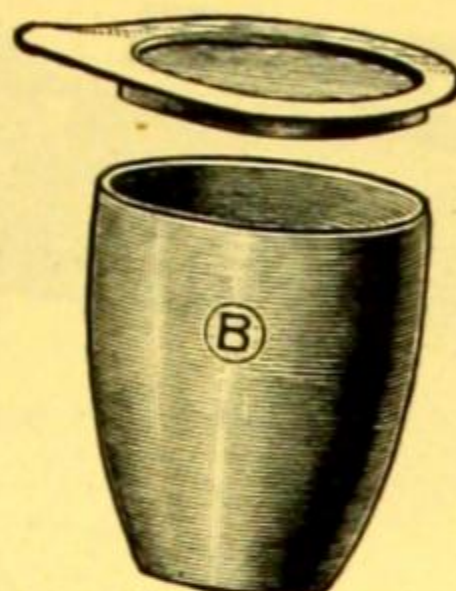
3425B. **Cover, only for No. 3424B Crucible** 1.80



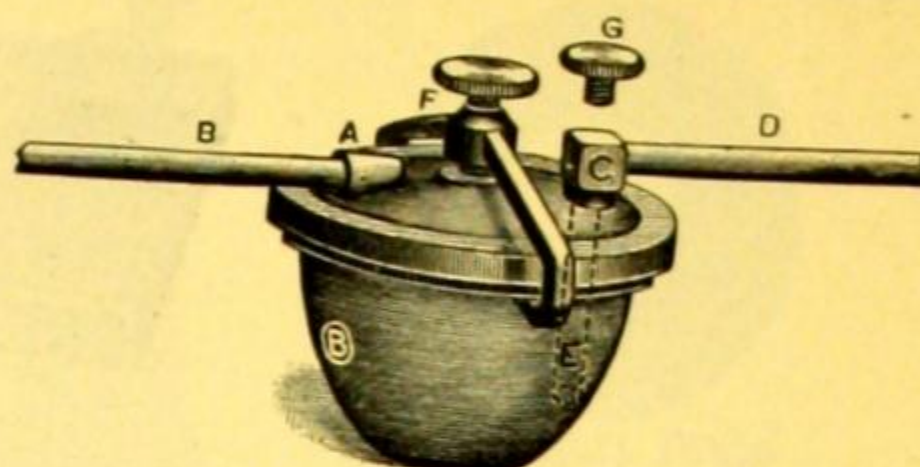
Nos. 3428-9.



No. 3432.



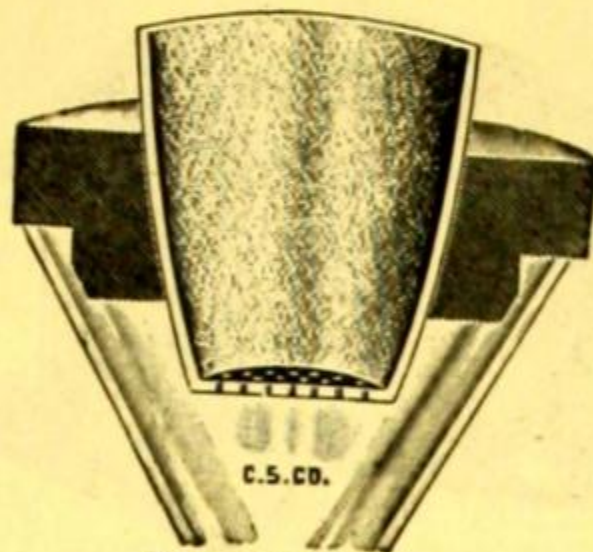
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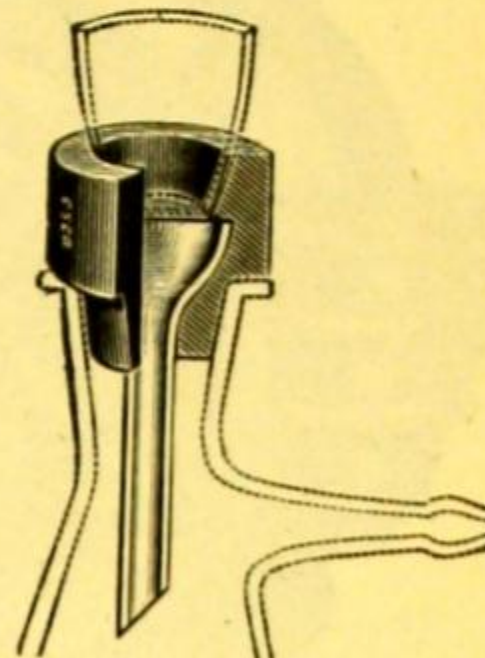
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No. 3446.

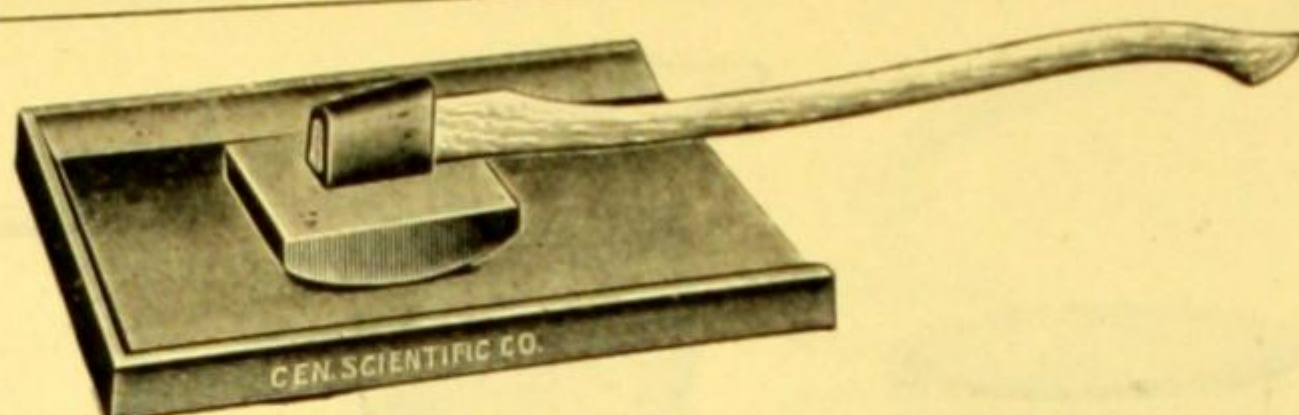


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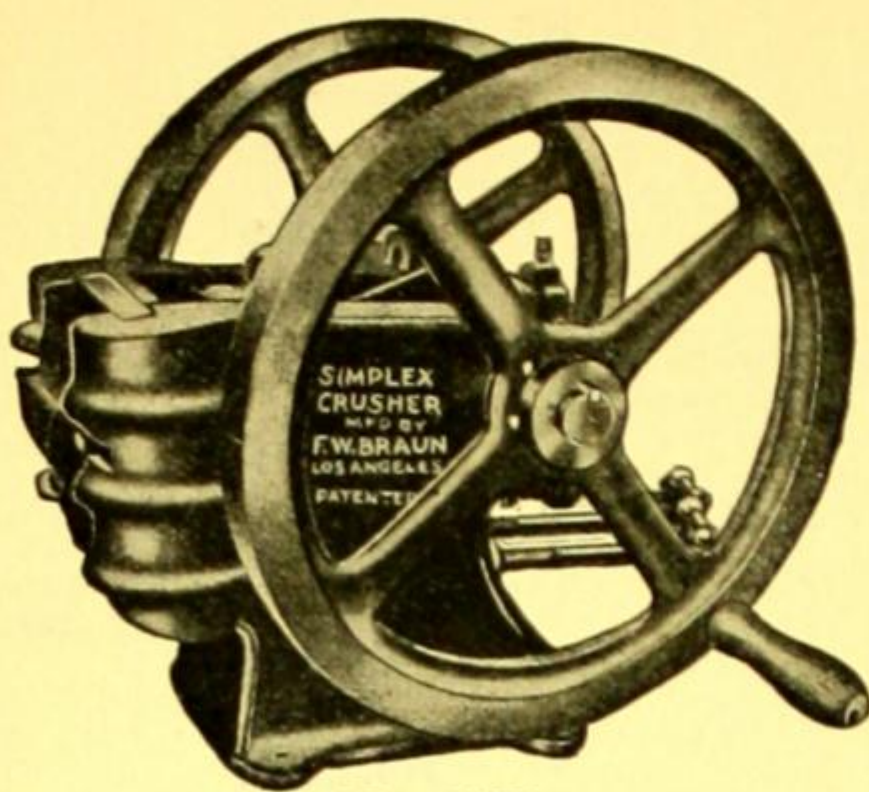


No. 3450.

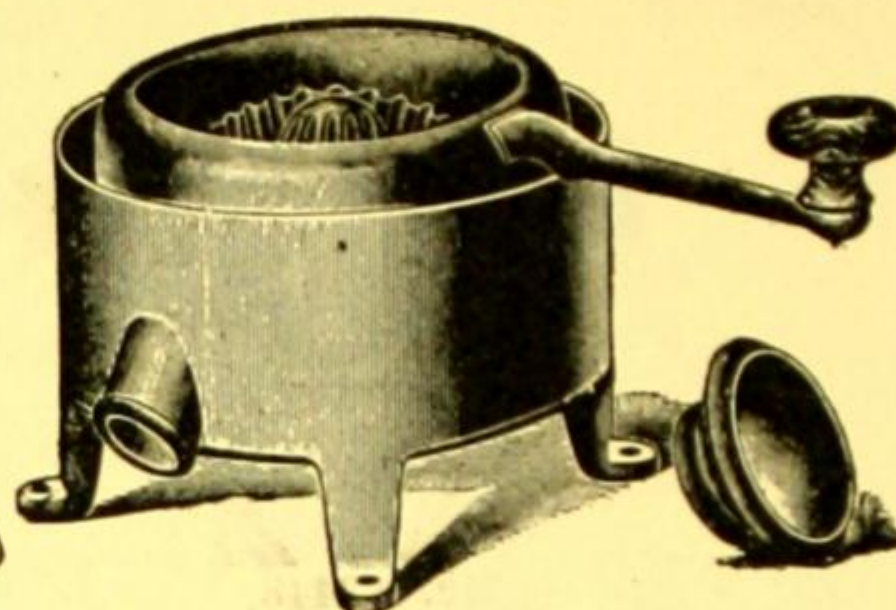
3428. **CRUCIBLES, Sand, Dixon's Assay, round form, without covers.** Sizes same as Battersea.
- | No. | A | B | C | D | E |
|-------------------------------|--------|-------|-------|-------|-------|
| Diameter outside, inches..... | 1 5/8 | 1 7/8 | 2 1/4 | 2 3/8 | 2 7/8 |
| Height outside, inches..... | 2 5/8 | 3 | 3 1/2 | 4 | 4 1/2 |
| Each | \$0.12 | .15 | .18 | .20 | .22 |
| Per 100 | 10.00 | 11.50 | 14.00 | 16.00 | 17.50 |
3429. **Covers for No. 3428 Crucibles.**
- | No. | A | B | C | D | E |
|---------------|------|-------|-------|-------|-------|
| Each | .11 | .13 | .14 | .15 | .16 |
| Per 100 | 9.25 | 10.50 | 11.00 | 11.75 | 12.00 |
3432. **CRUCIBLES, Opaque Fused Silica, wide form, 99.8% SiO₂.** May be subjected continuously to temperatures up to 1200°C., and for short periods to much higher temperatures. Not affected by rapid changes of temperature, nor by acids, except hydrofluoric, and above 400 degrees C., phosphoric.
- | No. | 000 | 00 | 0 | 1 | 2 | 3 |
|------------------------|--------|-------|-------|--------|-------|-------|
| Diameter, inches | 1 1/16 | 1 5/8 | 1 7/8 | 2 1/4 | 2 3/8 | 2 7/8 |
| Height, inches | 3/4 | 1 | 1 1/8 | 1 7/16 | 2 | 2 1/4 |
| Capacity, cc..... | 4 | 10 | 15 | 25 | 40 | 65 |
| Each | \$0.65 | .85 | .85 | 1.00 | 1.15 | 1.65 |
3433. **Covers, Opaque Fused Silica, for No. 3432 crucibles.**
- | No. | 000 | 00 | 0 | 1 | 2 | 3 |
|------------------------|-------|-------|-----|-------|-------|-------|
| For crucible, No..... | 000 | 00 | 0 | 1 | 2 | 3 |
| Diameter, inches | 1 3/8 | 1 3/4 | 2 | 2 1/4 | 2 3/8 | 2 7/8 |
| Each | .55 | .60 | .60 | .65 | .85 | 1.00 |
3438. **CRUCIBLES, Silver, spun from pure sheets, with cover.**
- | No. | A | B | C | D |
|----------------------------|-------|-------|-------|-------|
| Capacity, cc..... | 20 | 30 | 50 | 75 |
| Diameter, inches | 1 1/2 | 1 5/8 | 1 3/4 | 2 |
| Height, inches | 1 3/8 | 1 3/4 | 2 | 2 1/4 |
| Approx. weight, grams..... | 35 | 45 | 60 | 80 |
| Each | 3.20 | 4.00 | 5.00 | 6.80 |
3440. **CRUCIBLES, Skidmore's Normal School Retort and Crucible, spun of thin iron enabling it to be easily brought to a red heat in the flame of an ordinary burner. Can be used as an open or closed crucible, or retort. Specially adapted for use in making oxygen, in oxidation and reduction experiments, and in dry or steam distillations.**
- | No. | A | B |
|-----------------------|-------|------|
| Capacity, ounces..... | 1 1/2 | 6 |
| Each | 1.40 | 2.20 |
3446. **CRUCIBLE HOLDER, for use with any ordinary 60 degree funnel. Especially efficient, as the ring covers only about 1/8 inch of the upper rim of the crucible. Can be used with Gooch, Caldwell, Alundum or Johnson's Clay Crucibles. Made of one piece of soft rubber.**
- | No. | A | B | C |
|--------------------------------------|-----|-----|-----|
| For crucibles, top diameter, mm..... | 27 | 35 | 40 |
| Each | .15 | .20 | .20 |
3448. **CRUCIBLE HOLDER, Bailey's, of rubber, to take No. 3 Gooch crucible. For use with a 2 inch funnel, as shown. Rubber holder only.** .30
3450. **CRUCIBLE HOLDER, Walter's, of rubber with small glass funnel set in. The opening in the top will take a No. 3 Gooch Crucible of 25 cc capacity. The lower end is sharply tapered so that it will fit the neck of a 250, 500 or 1000 cc filter flask. Without flask or crucible.....** .35



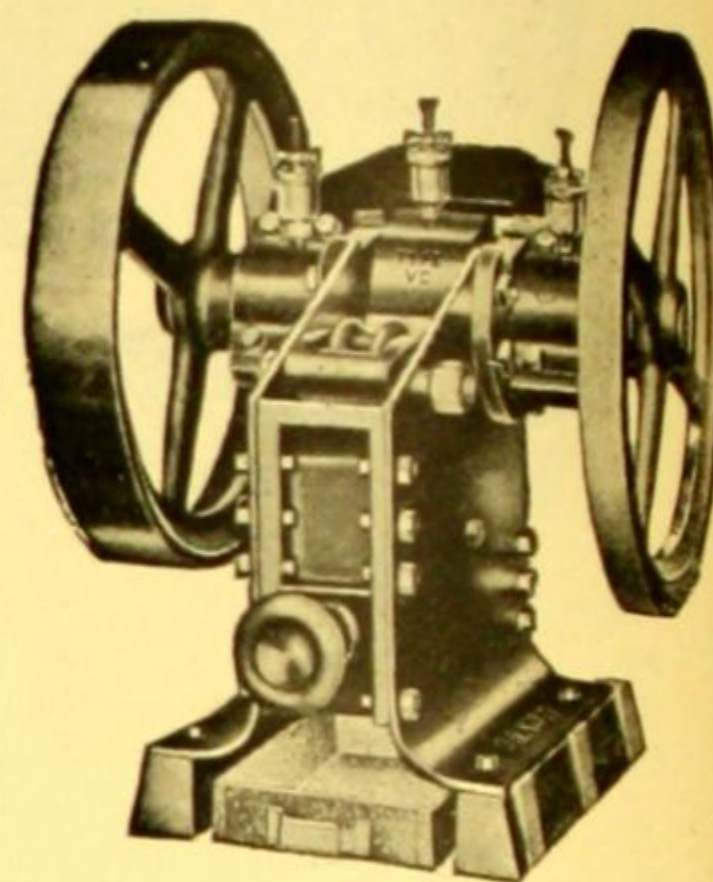
Nos. 3460.



No. 3470.



No. 3466.



No. 3474.

CRUSHING AND GRINDING APPARATUS

The crushers, grinders, mills and pulverizers listed in this section have been carefully selected to meet every requirement of the experimental and testing laboratory. They are all American made and have been in use for enough years under varied conditions to insure their serviceability and durability. In describing them, the attempt has been made in every case to state the particular uses for which they are best adapted, based on the experience of our trade.

We wish to direct especial attention to the Braun line of crushers, grinders and pulverizers, of which a complete line is carried in stock for immediate delivery.

3460. **CRUSHING PLATE, Bucking Board**, of chilled iron, with rim, for powdering ores, rock, etc. Complete with rubber of same material with set-in wooden handle.

No.	A
Size, inches	18x24
Weight, pounds	100
Each	\$15.00

3466. **CRUSHER, Weatherhead's**, for hand operation, for crushing and pulverizing at one operation. Can be used for any material, from clay to pig iron. Cover of machine is designed for use as small hand mortar, using end of handle as pestle. Diameter of crusher, about 12 inches; height, about 8 inches; weight complete, 100 pounds

38.00

BRAUN CRUSHERS

3470. **CRUSHER, Braun Simplex Ore**, for hand and power operation, for crushing small samples of ore. Fineness of the product can be easily controlled by turning two regulating screws provided with hand-wheels. The machine can be easily cleaned by removing with one blow of a hammer a wedge which holds the stationary jaw in place; the entire operation of opening and closing can be completed in one minute. Crushing plates are of hardest steel, and can be reversed or easily renewed when necessary. Capacity, 100 pounds of ore per hour reduced to $\frac{1}{4}$ inch and smaller. Height of machine over all, 18 inches; width, 15 $\frac{1}{2}$ inches; length, 20 inches; size of jaws, 6x3 inches; opening of jaws, 2 inches; diameter of wheels, 16 inches; power required, $\frac{1}{2}$ h. p.; speed of operation, 200 r. p. m.; shipping weight, 197 pounds

78.00

3474. **CRUSHER, Chipmunk, Improved Type VC**, for power, with all steel frames, rigidly secured together with strong studs. Bearings are of best phosphor-bronze which can be taken up when worn, or easily renewed. The fineness of the product is readily controlled by the hand wheel in front. The stationary jaw lifts out permitting easy and thorough cleaning of interior. When operating, the vibratory jaw is given a forward and downward motion at lower end compelling the discharge of the crushed material. A special feature of this machine is its large capacity for the size of the jaws. Dimensions: length over all, 18 inches; height, 19 inches; width, 19 inches; size of jaws, 3x6 inches; opening of jaws, 2 $\frac{1}{4}$ x3 inches; dimensions of pulleys, 16x2 $\frac{1}{2}$ inches; speed, 400 revolutions per minute; power required to operate, 1 h. p.; capacity, 300 to 400 pounds per hour; shipping weight, 235 pounds

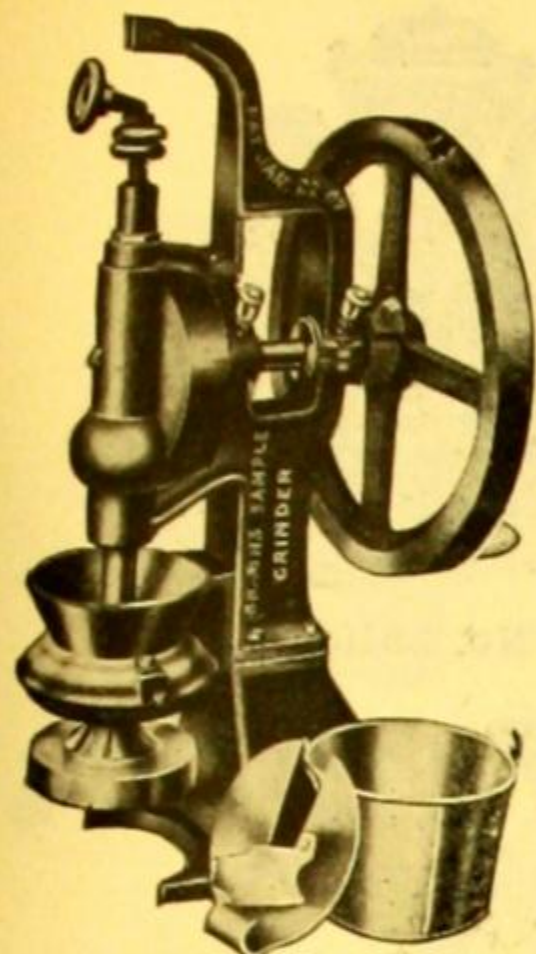
107.00

3476. **CRUSHER, Chipmunk Improved Type VC**, same as No. 3474, but with tight and loose pulleys for permanent connection to line shaft or motor. Shipping weight, 270 pounds

125.00

3480. **CRUSHER, Chipmunk Improved Type WC**, with tight and loose pulleys, of similar construction to No. 3476, but much larger. Dimensions: length over all, 22 inches; height, 26 inches; width, 25 inches; size of jaws, 9x4 inches; opening of jaws, 2 $\frac{3}{8}$ x4 inches; dimensions of pulleys, 20x3 inches; speed, 400 revolutions per minute; power required to operate, 2 h. p.; capacity, 1000 to 1500 pounds per hour; shipping weight, 515 pounds

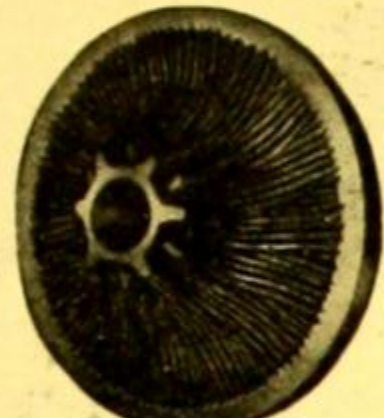
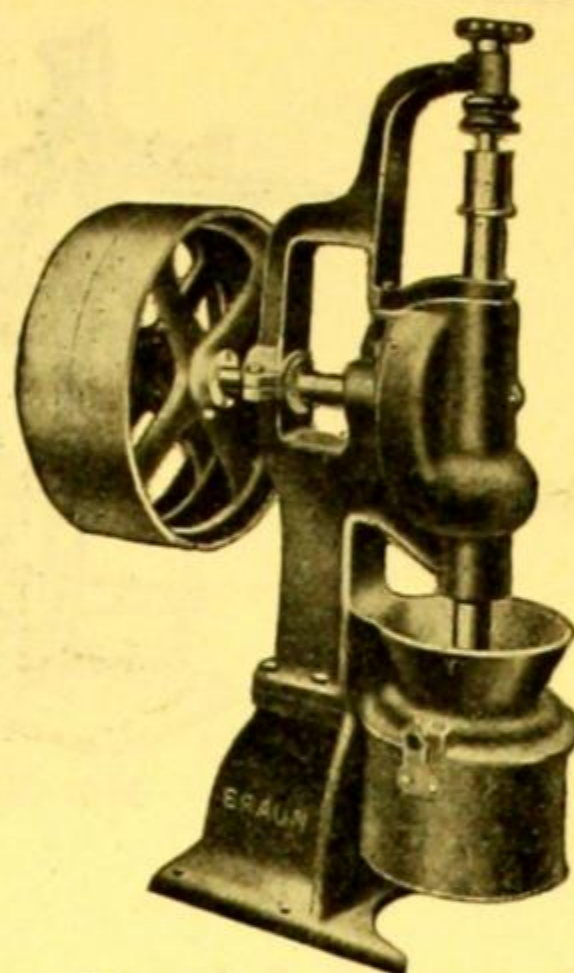
220.00



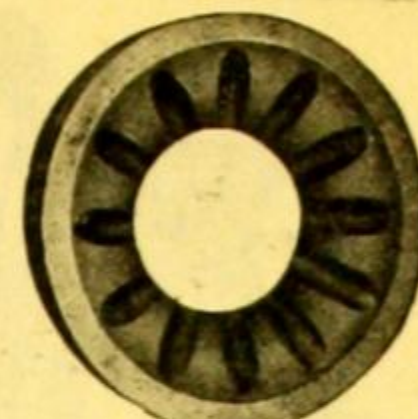
No. 3486.



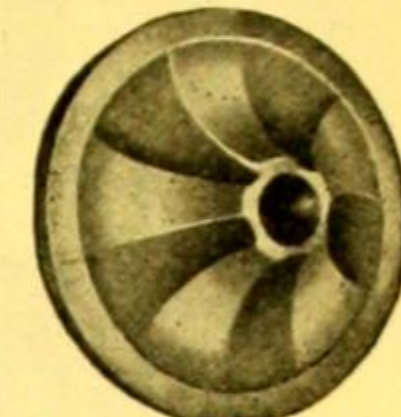
Stationary Plate

Revolving Plate
No. 3489.

Nos. 3488 and 3496.



Stationary Plate

Revolving Plate
Nos. 3490 and 3497.

BRAUN PULVERIZING MACHINERY

The material from the crushers having been reduced to particles about $\frac{1}{4}$ inch in size, the next operation is to carry the reduction to such a degree of fineness that the material is ready for assay or analysis. This reduction may be effected by either hand or power machines, depending upon the quantities of material being handled at one time by the laboratory and the frequency with which samples are in for analysis.

Where small quantities of material are handled at infrequent intervals a hand operated sample grinder may be used to good advantage. We offer No. 3486 for coal and coke, which may also be used for rock by the substitution of the Renewal Plates No. 3490 for Plates No. 3489. The same machine is listed as No. 3488 with tight-and-loose pulleys for power operation where continuous sampling is done in small quantities. No. 3496 corresponds to this in every respect, but is made specially for pulverizing iron ore.

Braun Pulverizer, Type U. A., described on next page, is of particular value in those plants or laboratories which desire to reduce a fairly large quantity of material to a fine powder in a very short interval, or in which samples are sent to the laboratory with such frequency as to keep a machine in practically continuous operation. It will reduce 1 pound of quartz ore from $\frac{1}{4}$ inch particles to 100 mesh in one minute.

An excellent combination for such laboratories consists of a No. 3476 or 3480 Chipmunk Crusher, a No. 3578 U. A. Pulverizer and a No. 11812 Sampler mounted in a row and connected to a common line shaft.

3486. **GRINDER, Braun Sample, for Coal and Coke, or for Rock, for hand operation.** A laboratory machine which will pulverize 2 pounds of coal to 20 mesh in one minute, or 2 ounces to 80 mesh in five minutes; will reduce 2 pounds of coke to 20 mesh in 6 minutes, or 2 ounces to 80 mesh in 7 minutes; by the use of Plates No. 3490, it will pulverize 4 ounces of hard quartz rock to 60 mesh in two minutes, or to 100 mesh in 3 minutes. All parts such as gears, are enclosed, making machines dust proof, eliminating danger, and preventing loss of any material. Bucket is readily removed and revolving plate lowered to facilitate cleaning. Dimensions: height over all, 31 inches; width, 21 inches; diameter of hand wheel, 16 inches; diameter of grinding plates, 6 inches; shipping weight, 180 pounds. Complete with one set of grinding plates for coal and coke only \$100.00

Note:—This machine can be operated by power, using hand wheel as pulley. Power required, $\frac{1}{2}$ h. p.; speed, 200 revolutions per minute.

3487. **GRINDER, Braun Sample, same as No. 3486 but equipped with plates No. 3490 for grinding rock** 100.00

3488. **GRINDER, Braun Sample, for Coal and Coke or for Rock, for power, same as No. 3486, but fitted with tight and loose pulleys for permanent installation. Shipping weight, 190 pounds. Complete with one set of grinding plates for coal and coke only** 110.00

3488A. **GRINDER, Braun, Sample, same as No. 3488, but equipped with plates No. 3490 for grinding rock** 110.00

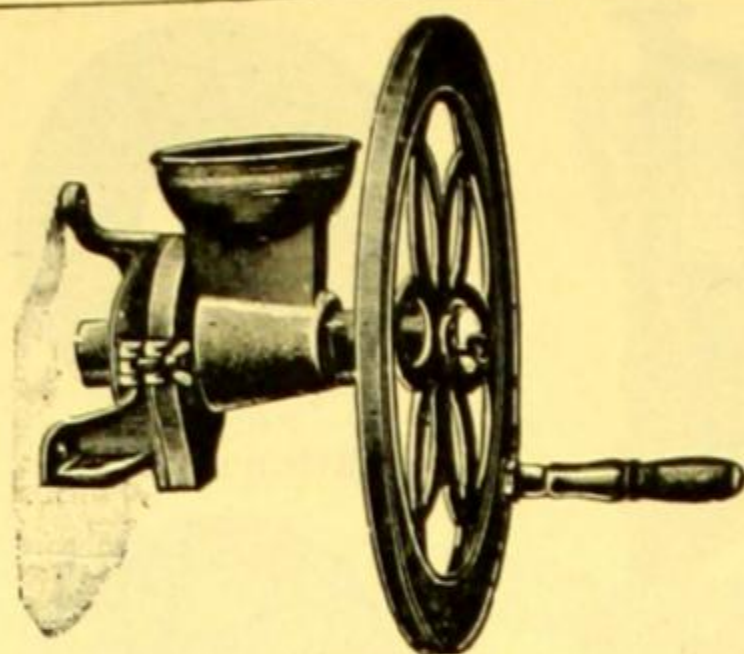
3489. **RENEWAL PLATES, for coal and coke only, for Nos. 3486 and 3488** per set 9.00

3490. **RENEWAL PLATES, for rock only, for Nos. 3487 and 3488A** per set 9.00

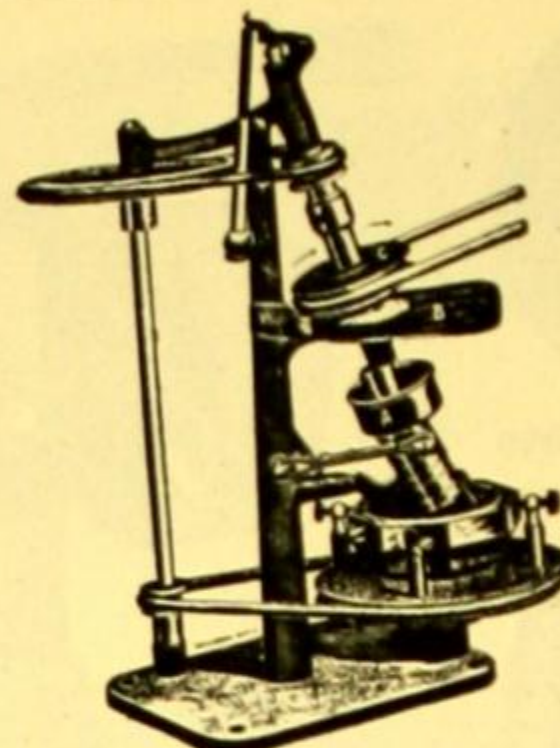
3496. **GRINDER, Braun Sample, for Iron Ore, for power, with special 6 inch carbon steel grinding plates, with low phosphorus content.** A high speed machine for power only; lightly but substantially constructed for intermittent use; will pulverize 1 pound of iron ore to 100 mesh in 2 minutes. Equipped with special bearings, machine cut gears and tight and loose pulleys. Dimensions: width, 24 inches; height, 31 inches; dimensions of pulleys, 6x2 inches; speed of pulleys, 500 revolutions per minute; speed of grinding plates, 800 revolutions per minute; shipping weight, 190 pounds. Power required to operate, 1 h. p. Complete with one set of grinding plates 130.00

3497. **RENEWAL PLATES for No. 3496, of carbon steel** per set 21.00

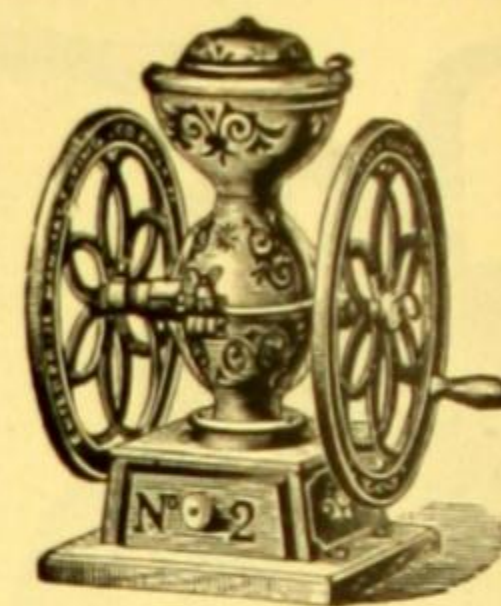
Note:—Prices on renewal parts for any of the preceding Sample Grinders quoted upon application.



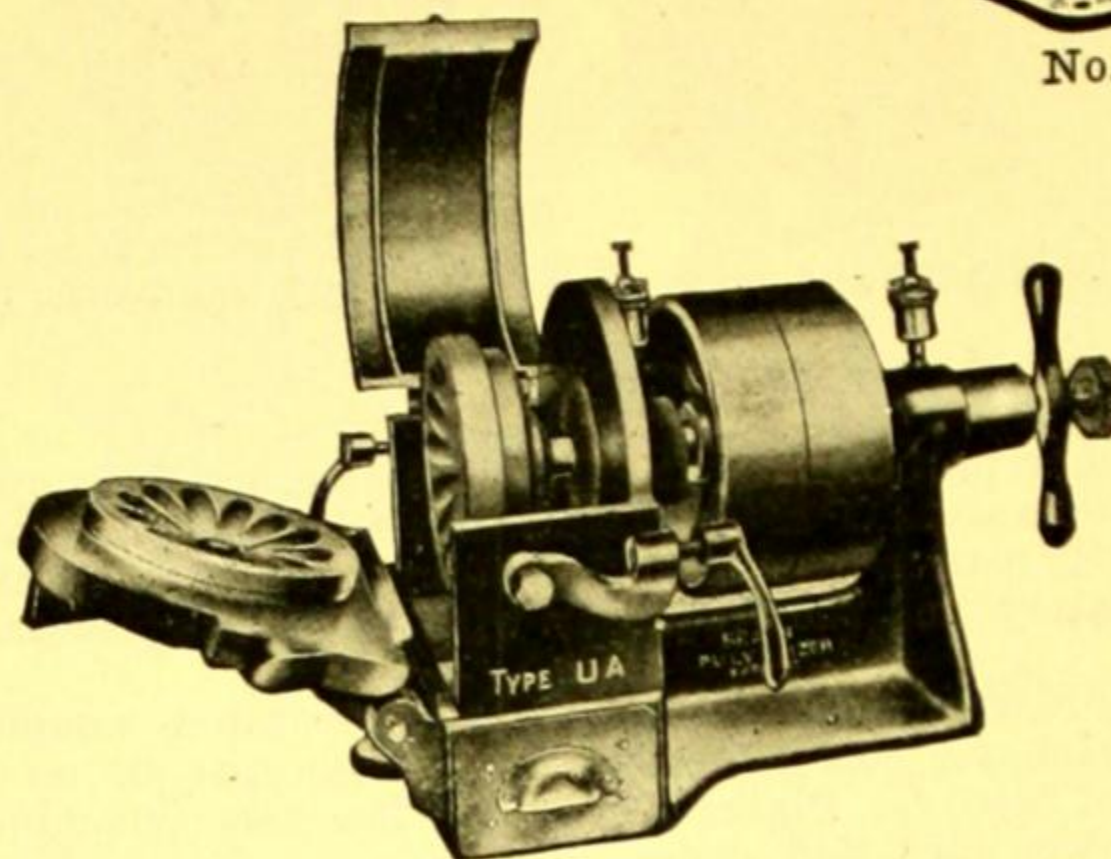
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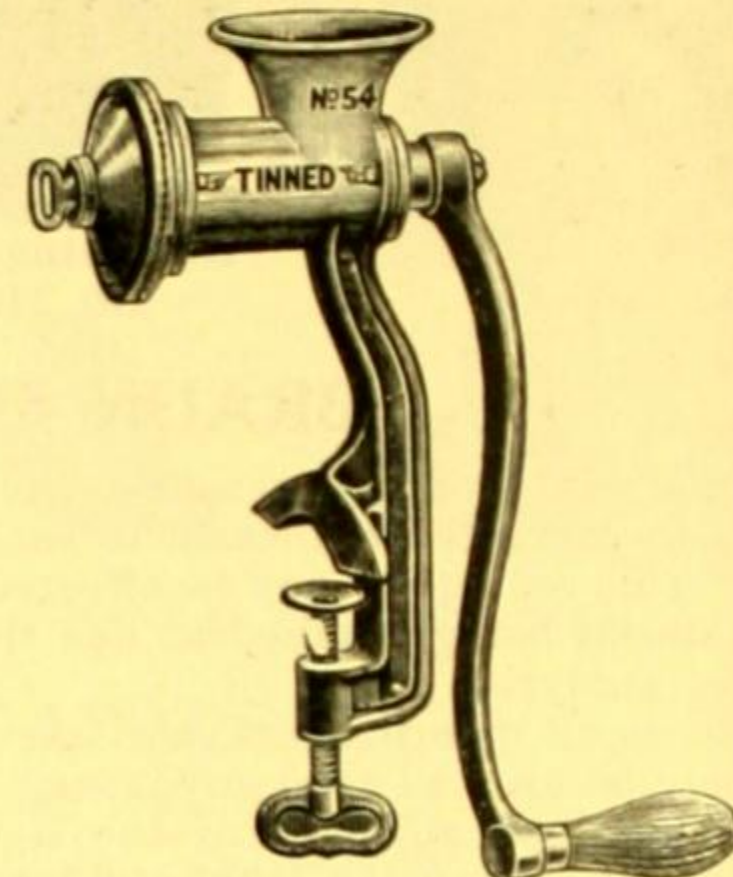
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No. 3510.



No. 3578.

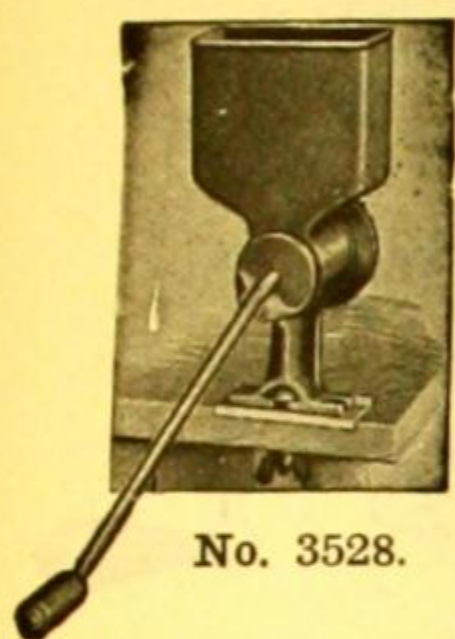


No. 3522.

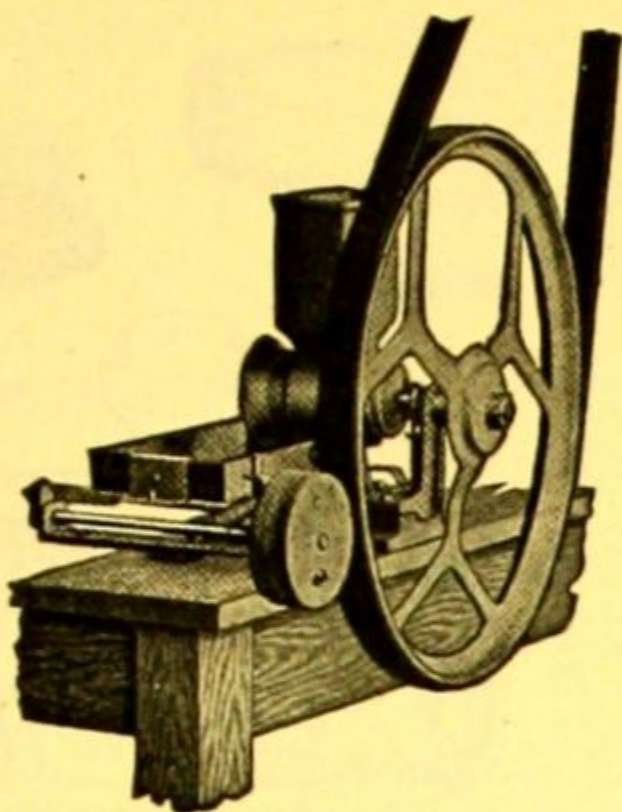
3578. **PULVERIZER, Braun, Type U. A.**, with tight and loose pulleys for power use. The grinding plates are made of special alloy possessing a high degree of wearing quality and durability. They are specially designed to secure best possible service, and can be easily replaced. The large and small lugs (shown in the illustration) act as breakers and carriers while the outer surfaces effect the pulverizing. The grinding plates are held in place in such a way that no screw heads or bolt heads protrude, and can be quickly and easily removed. The machine opens up so that every particle of material can be brushed into the pan. The interior is smooth finished with all parts easily accessible for cleaning. The pulverizer is fed through a spout in the door and will take particles up to $\frac{1}{4}$ mesh and reduce to 100 mesh at one grinding. Length of machine, 23 inches; width, 14 inches; height, 14 $\frac{1}{2}$ inches; size of pulleys, 9x2 $\frac{1}{2}$ inches; speed, 850 r. p. m.; power required to operate, 1 h. p.; shipping weight, 275 pounds; capacity (quartz ore), 1 pound to 100 mesh in 1 minute.....\$149.00
3579. **EXTRA GRINDING PLATES** for Braun Pulverizerper set 9.00

MISCELLANEOUS GRINDERS AND MILLS

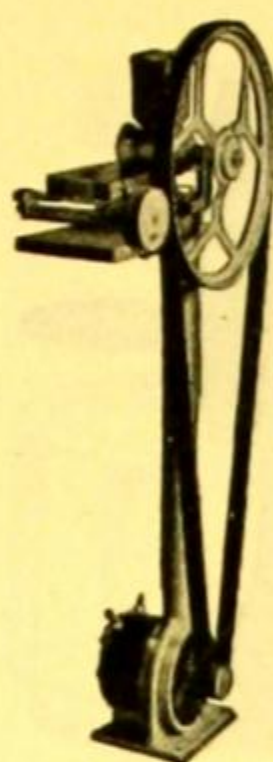
3501. **GRINDER, Laboratory Ore**, with Agate Mortar and Pestle, for power, for reducing ore and rocks to an impalpable powder. The pestle is attached to a sliding rod held down by a spring at the top, so as to produce constant pressure on the mortar, which revolves slowly in the same direction as the pestle, producing a combined rolling and sliding motion similar to that in hand grinding. A scraper operates to keep the ore in the center of the mortar. By dropping one of the posts on the platform and raising the pestle, the mortar can be quickly removed. The machine is so constructed that no oil or foreign substance can contaminate the sample. Height of machine, 18 inches; diameter of mortar, 4 $\frac{1}{4}$ inches; power required to operate, $\frac{1}{4}$ h. p., at a speed of 250 r. p. m.; shipping weight, 40 pounds. (For complete description see Bulletin 422, of the United States Geological Survey, "The Analysis of Silicate and Carbonate Rock," by W. F. Hillebrand, page 55) 83.50
3510. **GRINDING MILLS, Laboratory and Drug**, for hand operation, for grinding herbs, roots, grains, feed and other dry substances.
- | | | | | |
|------------------------------|------------------|------------------|------------------|------------------|
| No. | 2 | 3 | 5 | 7 |
| Height, inches | 12 $\frac{1}{2}$ | 15 | 17 | 21 $\frac{1}{2}$ |
| Diam. of wheels, inches..... | 8 $\frac{3}{4}$ | 10 $\frac{3}{4}$ | 12 $\frac{1}{2}$ | 17 |
| Weight, pounds | 15 | 22 $\frac{1}{2}$ | 36 | 62 |
| Each | 7.00 | 11.00 | 16.00 | 21.00 |
3516. **GRINDING AND PULVERIZING MILL**, for hand operation, for soils, grains, dry bone, limestone, rock phosphate, etc. Compact, strong, and durable. Height, 11 inches; length, 12 inches; width, 9 inches; dimensions of throat, 3x2 inches; diameter of handwheel, 19 inches; weight complete, 47 $\frac{1}{2}$ pounds..... 13.50
3522. **GRINDING AND PULVERIZING MILL, Nixtamal**, for hand operation, for soils, herbs, grains, coal, dry bone, limestone, etc. Will pulverize limestone fine enough to pass through a 100 mesh sieve. Capacity (grain) 5 pounds per minute. Total weight, 24 pounds. Complete with three sets of grinding disks, coarse, medium and fine..... 15.00



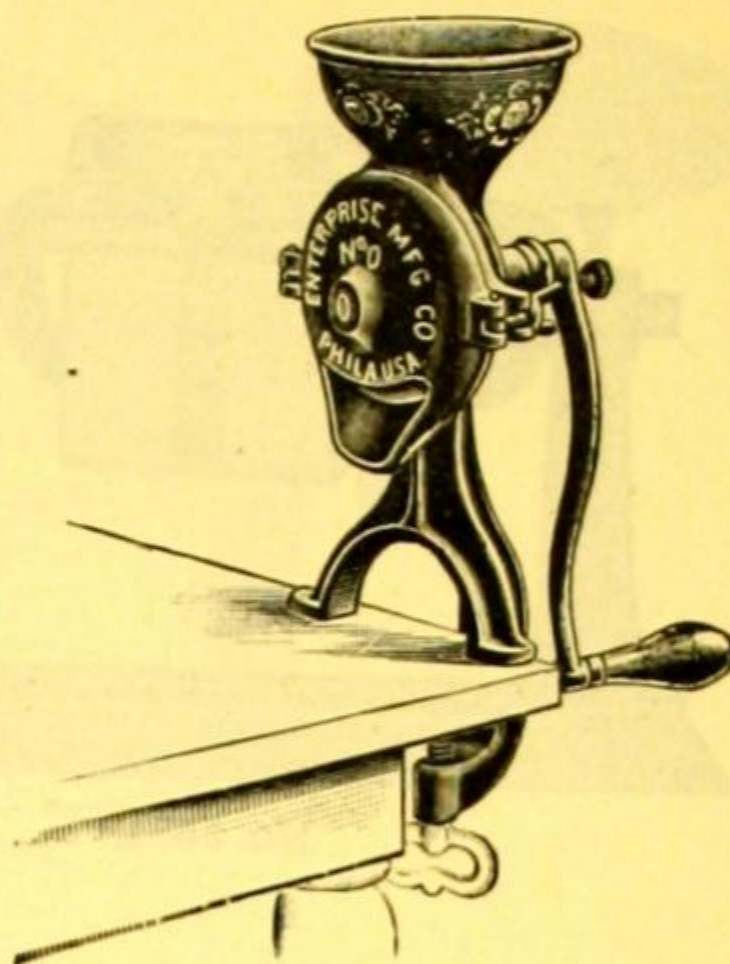
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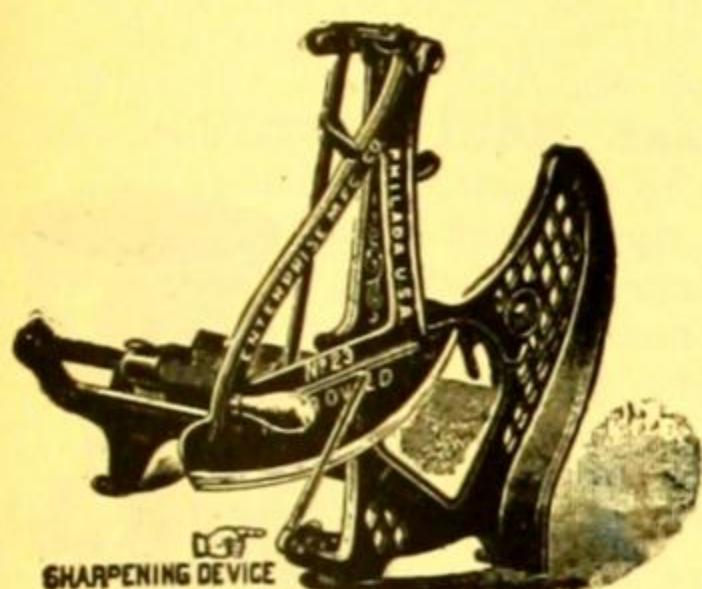
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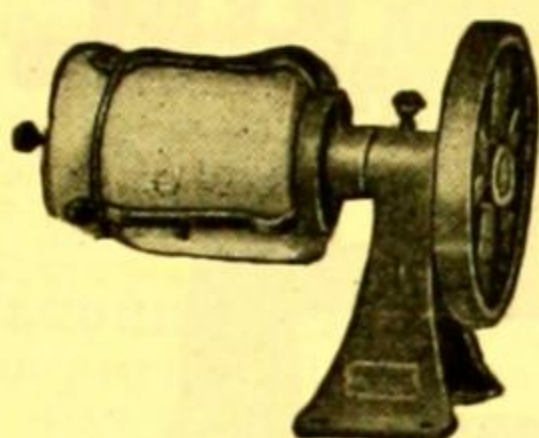
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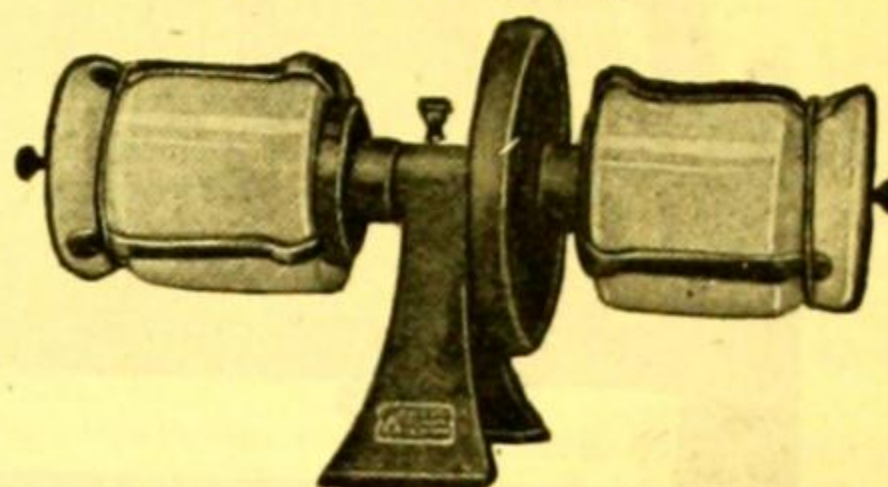
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No. 3542.

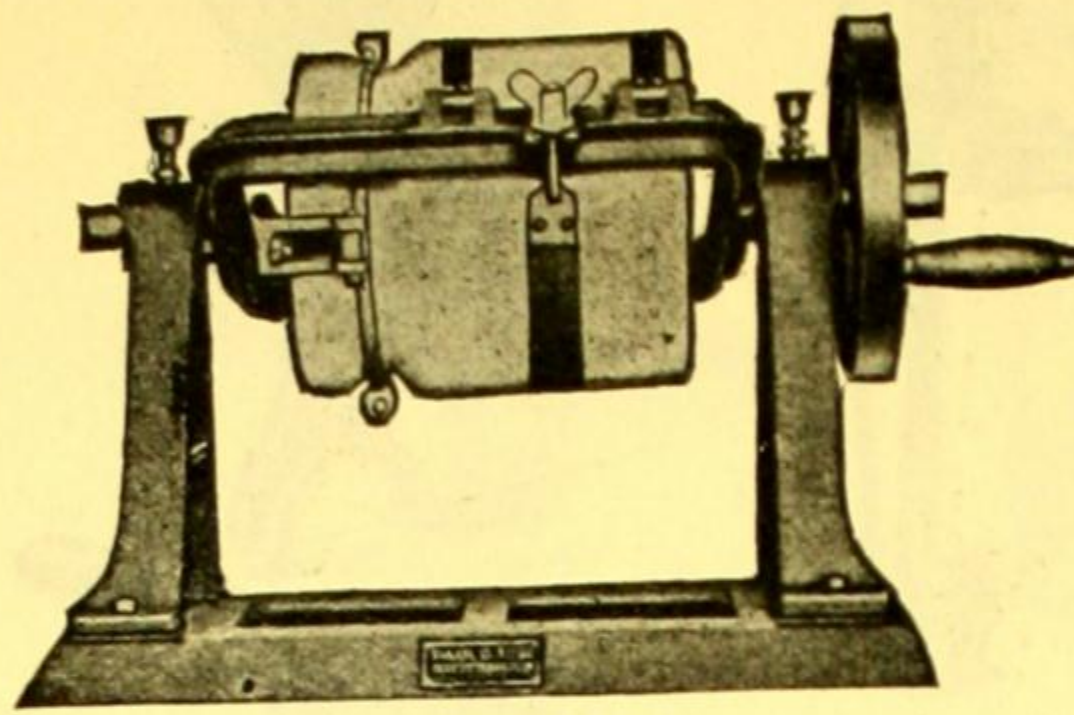


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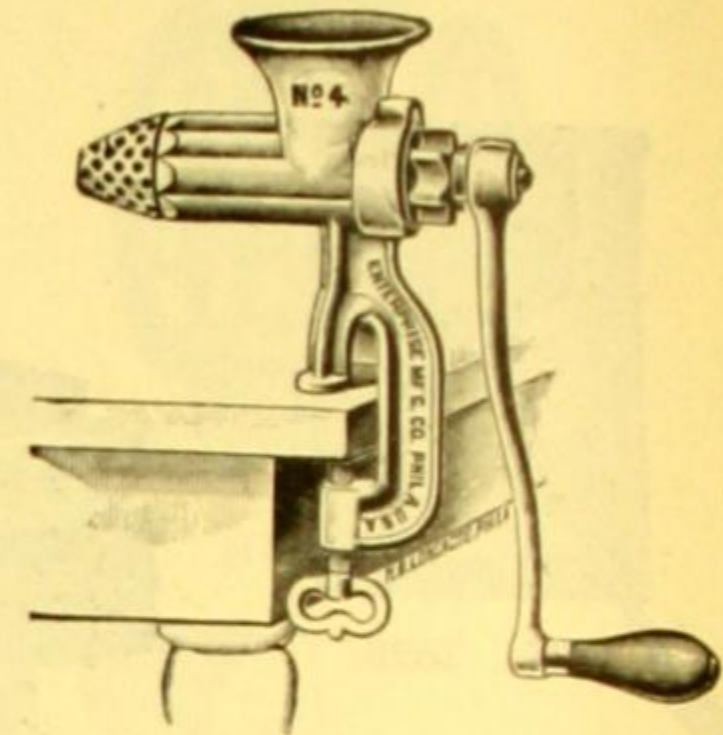


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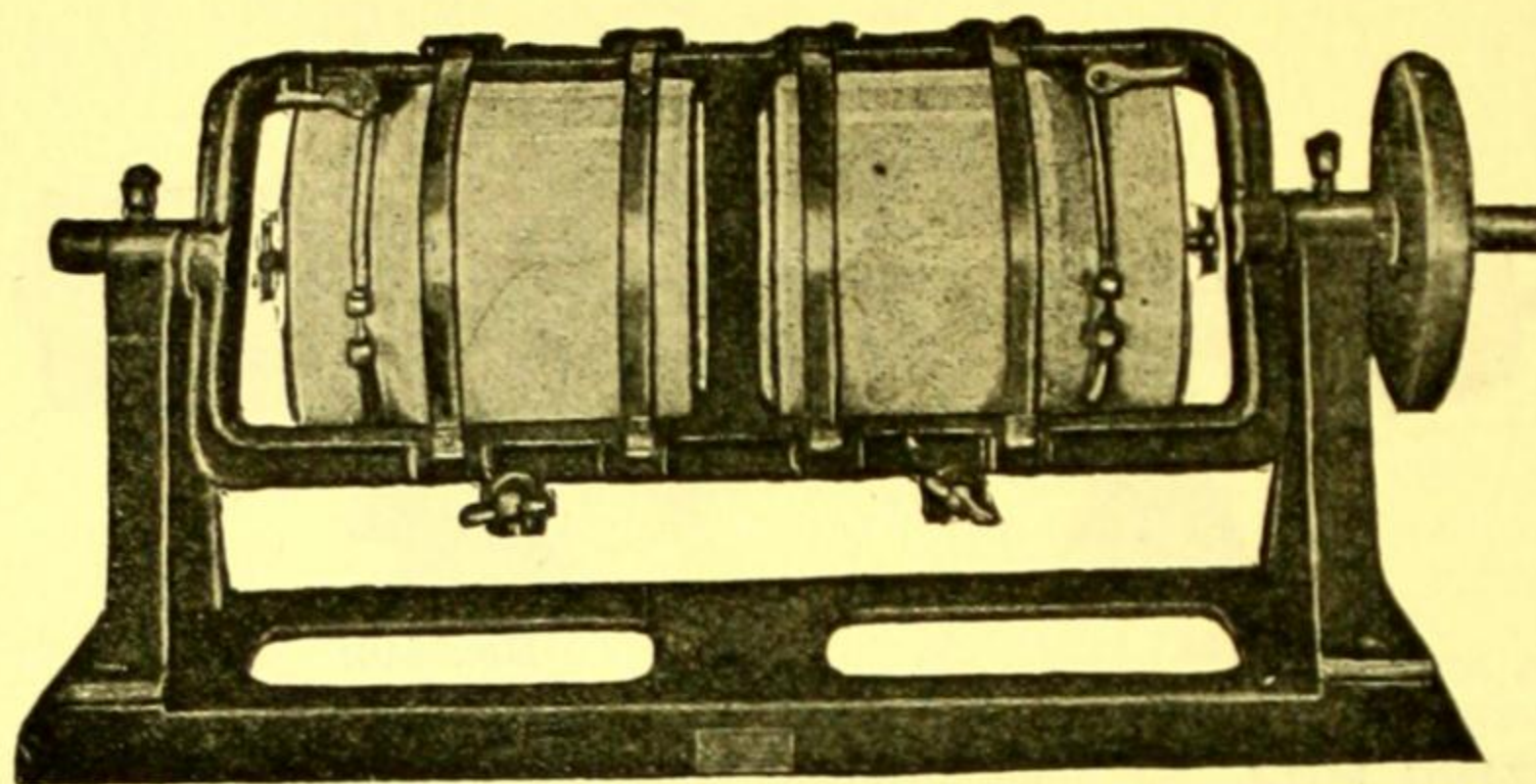
3528. **GRINDING AND PULVERIZING MILL**, for hand operation, specially designed for grinding small samples of wheat for flour analysis. Can also be used for coal, ore, grains, etc. Burrs are made of special hard steel alloy. Adjustable for different degrees of fineness. Parts can be easily taken apart for cleaning. For hand power, with crank handle of rolled steel, 9 inches in length. Shipping weight, 10 pounds \$7.50
3530. **GRINDING AND PULVERIZING MILL**, for hand or power, same as No. 3528, but with hand-wheel, which can also be used for pulley. Flexible connection between hand-wheel and mill permits easy release of mill for thorough cleaning. Shipping weight, about 20 pounds 11.50
3534. **GRINDING AND PULVERIZING MILL**, for power, same as No. 3530, but with a bolter which oscillates under outlet to separate ground material into two grades. With two interchangeable bolter boxes, each having a different grade of cloth. Shipping weight, about 25 pounds. Takes a 1 inch belt 22.00
3536. **GRINDING AND PULVERIZING MILLS**, for power, same as No. 3534, but mounted on pedestal base with motor, for bolting directly to floor. Can be connected to any incandescent lamp socket. Shipping weight, 75 pounds. Complete with two bolter boxes.
- | | | |
|----------------|----------|----------|
| No. | A | C |
| For volts..... | 110 A.C. | 110 D.C. |
| Each | 66.00 | 66.00 |
3540. **GRINDING MILL**, Enterprise No. O, for hand power, recommended by the Joint Rubber Insulation Committee, for grinding samples of rubber and insulating compounds for analysis. (See Journal of Industrial and Engineering Chemistry, Vol. IX, No. 3, for March 1917, page 313) 3.00
3542. **MILL**, Bagassee Cutter, for hand operation, for cutting slices from bagassee and other fibrous material for analysis. The thickness of the slices can be controlled by a special regulating device from thinnest shavings to slices $\frac{1}{8}$ inch thick. With automatic feed..... 20.00
3544. **MILL**, Single Specimen Ball, for power, for pulverizing small samples of any material. Consisting of a porcelain jar, mounted as shown with 9x1 inch pulley for power drive. Size of jar outside, 5.2x5.7 inches; floor space, 9x11 inches; speed, 80 to 120 r. p. m.; shipping weight, 50 pounds; capacity dry, $\frac{1}{4}$ ounce to $1\frac{1}{2}$ pounds at a charge; capacity wet, $\frac{1}{4}$ gallon. Complete with charge of flint pebbles..... 22.00
3546. **MILL**, Double Specimen Ball, same as No. 3544, but with two jars mounted to revolve on same axis. Floor space, 9x18 inches; shipping weight, 75 pounds..... 33.00
3547. **Porcelain Jars** for Mills Nos. 3544 and 3546, size 5.2x5.7 inches; capacity, 1 quart..each 8.25



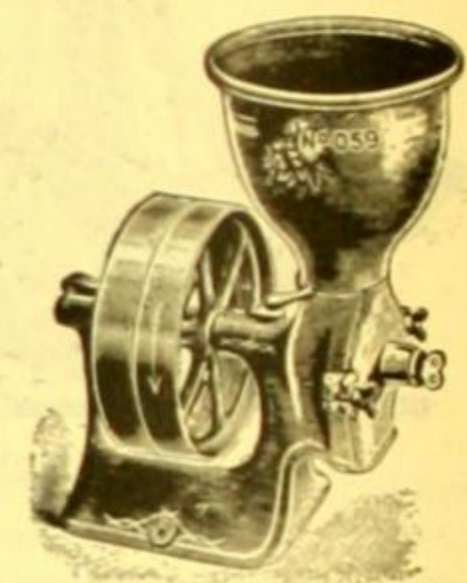
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No. 3572.

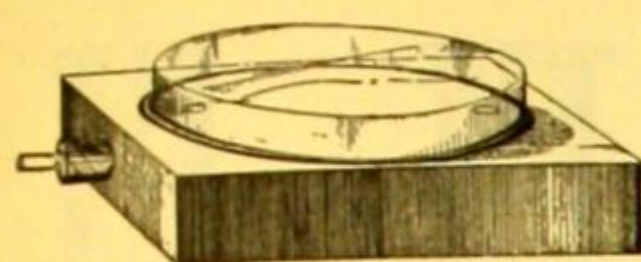


No. 3558.

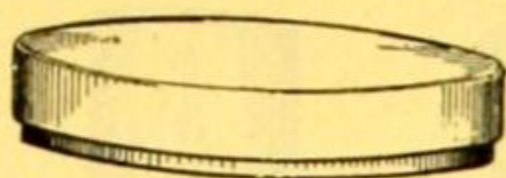


No. 3564.

3554. **MILL, Single Assay, for hand or power**, for reducing to an impalpable powder any materials, either hard or soft, particularly those which must not come in contact with metals. Widely used in assay, cement, and soil laboratories. Size of jar, 8.75x9.65 inches; height of mill, 19 inches; floor space, 14x25 inches; height, 19 inches; size of pulleys, 3x1 inches; speed, 60 to 75 r. p. m.; shipping weight, 125 pounds; capacity dry, 1 ounce to 5 pounds at a charge; capacity wet, 1 gallon; h. p. required to operate, $\frac{1}{20}$. With handle for hand operation and with charge of flint pebbles..... \$45.00
3558. **MILL, Double Assay, for hand or power**, same as No. 3554, with two porcelain jars, 8.75x9.65, mounted to revolve on same axis. Floor space, 14x35 inches; shipping weight, 200 pounds. With pulley 9x1 inch for power, provided with handle for hand operation, and with charge of flint pebbles 72.00
3559. **Porcelain Jars**, 8.75x9.65 inches, with capacity of 1 gallon. For Mills Nos. 3554 and 3558. With cover but without clamp.....each 17.00
3560. **Porcelain Balls for Mills Nos. 3544 and 3558.**
- | | | | |
|------------------------|---------------|---------------|-----|
| Diameter, inches | $\frac{1}{2}$ | $\frac{3}{4}$ | 1 |
| Per pound | .85 | .80 | .70 |
3564. **MILL, Grinding and Pulverizing, for power**, with tight and loose pulleys. Can be regulated to grind coarse or fine while running. Adapted for grinding leather samples, cotton seed, cereals, feed, etc. Height, 20 inches; length, 15 inches; speed, 250 r. p. m.; power to operate, $\frac{1}{2}$ h. p.; capacity of hopper dry, 5 pounds; capacity of grinder, $\frac{1}{2}$ pound per minute; shipping weight, 73 pounds 40.00
3572. **MILL, Beet Shredding**, with knives and plates of steel. External parts tinned to prevent rusting. Easily taken apart for cleaning. Capacity, 4 ounces per minute. Weight, 18 ounces 2.00
3578. **PULVERIZER, Braun Type U. A.**, see page 166.
For **SAMPLERS, RIFFLE PLATES**, etc., see **Sampling Apparatus**.



No. 168.



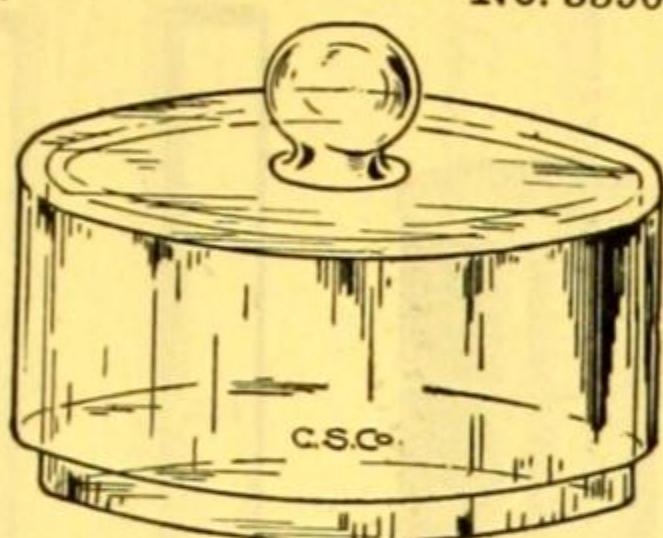
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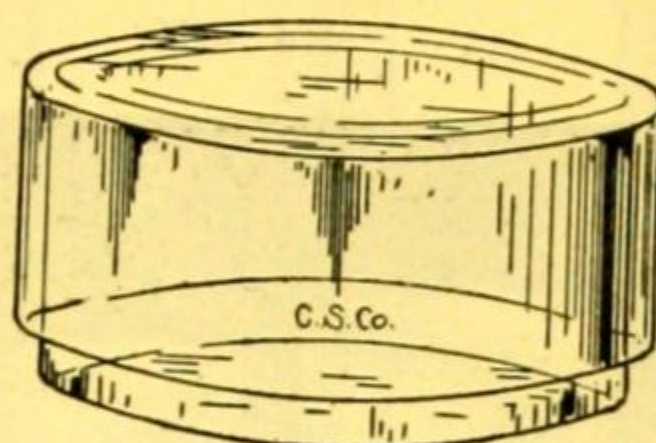
No. 3592.



No. 3594.



No. 3599.



No. 3601.

CRYSTALIZING DISHES, see Dishes.

CULTURE DISHES

168. **CULTURE DISH, Anaerobic**, designed by H. M. Jones, of the United States Department of Agriculture. Consists of an Alberene stone base 2 cm thick and 12 cm square, with an annular groove to receive an inverted 100 mm Petri dish. The base is provided with outlet tubes so that gas and pyrogallate methods may be used. The groove may be sealed with paraffine or other wax. The small amount of air enclosed, about 20 cc, permits rapid results to be secured, which are readily visible. (See Journal of Bacteriology, Vol. I, No. 3, for May, 1916, page 339.) \$1.80

- For other **ANAEROBIC CULTURE APPARATUS**, see page 11.
3590. **CULTURE DISHES, Petri**, in pairs, of clear glass with flat bottoms, well annealed to withstand sterilizing. The standard dish for plating bacteria is the 100x10 mm size, the bottom dish of which is 95 mm outside diameter. The 75x10 mm dish is used for drying the bacterial mass in the preparation of vaccines and in pneumococcus protection tests.

No.	A	B	D	E	G
Diameter of upper dish, mm.....	50	75	100	100	150
Depth, mm	10	10	10	15	20
Per pair	.22	.25	.30	.30	.70

10% discount in lots of 12, 20% discount in lots of 144.

3591. **Culture Dish Parts, Petri**, same as No. 3590, but single tops and bottoms only. The tops are suitable for use as a bottom dish with the Nos. 3592 and 3594 earthenware covers.

No.	A	B	C	D
Part	Top	Top	Bottom	Bottom
Outside diameter, mm	100	100	95	95
Depth, mm	10	15	10	15
Each	.17	.17	.17	.17

10% discount in lots of 12, 20% discount in lots of 144.

3592. **CULTURE DISH COVERS, Porous Earthenware**, unglazed, for use with 100 mm Petri dish covers. Will absorb condensed water during incubation, which would otherwise drip on to the plated material, spreading the growths.....each .13

10% discount in lots of 12, 20% discount in lots of 144.

3594. **CULTURE DISH COVERS, Glazed Earthenware**, same as No. 3592, but glazed outside only. Prevents absorption of spilled liquids such as liquified gelatine, etc., and facilitates the removal of wax pencil markings.....each .16

10% discount in lots of 12, 20% discount in lots of 144.

3596. **CULTURE DISH, Petri, with ruled bottom**. Same as No. 3590D, but with bottom ruled into square centimeters to facilitate counting of colonies. Size, 100x13 mm..... .50

10% discount in lots of 12.

3599. **CULTURE DISHES, Moist Chambers**, double dishes of heavy clear glass, with loosely fitting cover with knob.

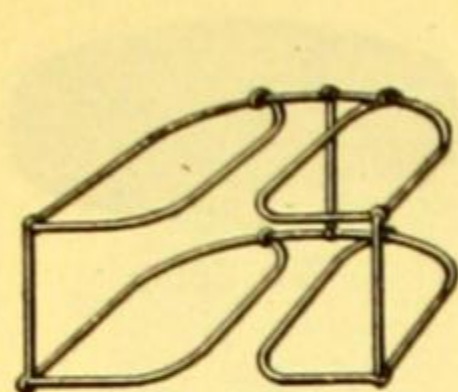
No.	A	B	C
Outside diameter of cover, mm.....	150	200	240
Inside depth, mm.....	40	70	80
No. per barrel.....	48	12	8
Each	1.20	1.70	2.60

10% discount in lots of 12.

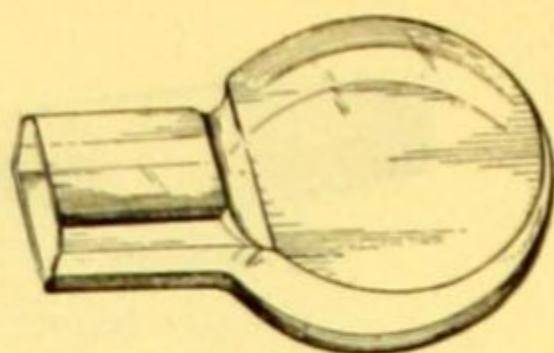
3601. **CULTURE DISHES, Moist Chambers**, same as No. 3599, but without knob on cover enabling these dishes to be stacked.

No.	A	B	C
Outside diameter of cover, mm.....	150	200	240
Inside depth, mm.....	40	70	80
No. per barrel.....	48	12	8
Each	1.00	1.40	2.00

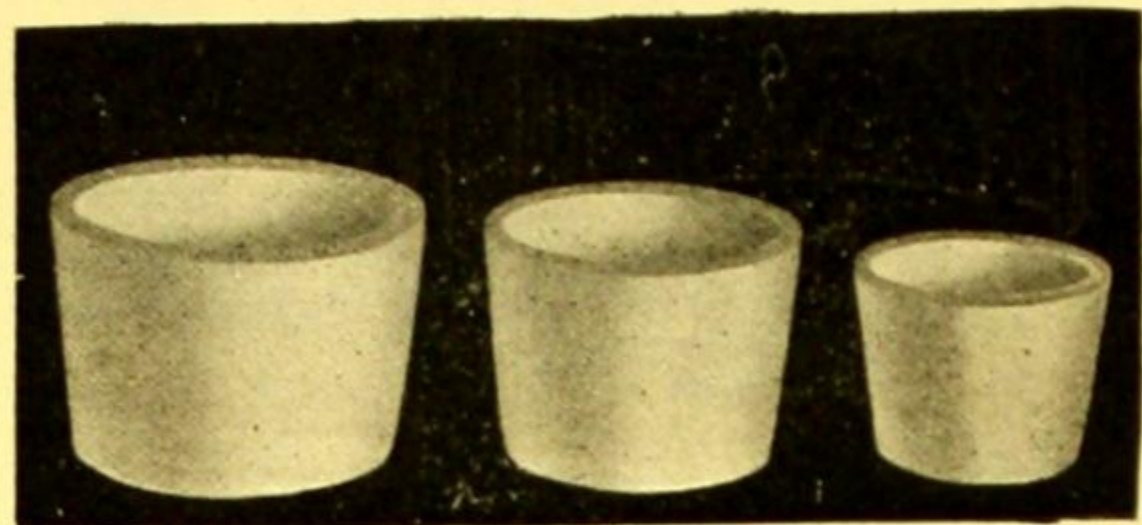
10% discount in lots of 12.



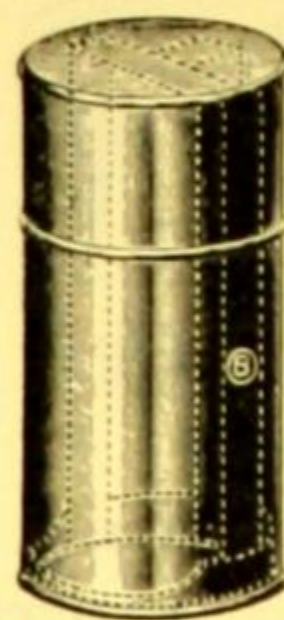
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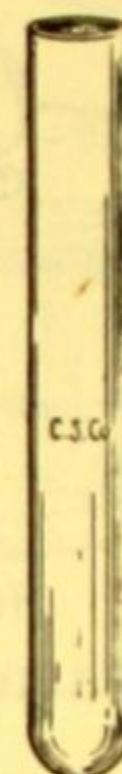
No. 3616.



No. 3628.



Nos. 3604-5.



No. 13359.



No. 13382.



No. 13400.

3602. **CULTURE DISH HOLDERS, Ravenel**, of nickel-plated spring wire, to hold dishes 100 mm in diameter for incubation or sterilization.

No.	A	B
To hold, dishes.....	3	6
Each	\$0.50	.50

3604. **CULTURE DISH HOLDER**, for 100 mm dishes, of polished copper, with inside tray for removing dishes. Size, 9 inches high by 4½ inches in diameter..... 4.00

3605. **CULTURE DISH HOLDER**, same as No. 3604, but made of sheet iron..... 3.00
For **SEAMLESS TIN BOXES** for holding five 100x10 mm or four 100x15 mm culture dishes, see No. 1828, 24 oz.

3616. **CULTURE FLASKS, Kolle**, of Pyrex glass, with neck indentation to prevent the culture medium from flowing out. Extensively used in the preparation of typhoid vaccine. Capacity, 320 cc; number in original case, 84.....each .75
per case containing 84 56.70

CULTURE SLIDES, see **Microscope Accessories**.

13359. **CULTURE TUBES, heavy wall**, ordinary glass without lip, for bacteriological and serological work. The 100x13 mm tube is the usual size for Wasserman work. The 75x10 mm tube is used as the inner tube, with the 150x18 as the outer tube in making up Durhams fermentation tubes. The 125x16 and 150x18 are the usual sizes for bacteriological cultures. These tubes are free from the corrosive effects of repeated autoclaving.

No.	A	B	C	D	E	F
Length, mm	75	100	125	150	150	200
Outside diameter, mm.....	10	13	16	16	18	25
Per dozen	.17	.21	.28	.30	.31	.82
Per gross	1.75	2.15	2.85	3.00	3.10	8.25

20% discount from gross price in lots of 12 gross.

13382. **CULTURE TUBE, Potato**, ordinary glass, with lip, with constriction and bulb at the bottom. Length, 150 mm; diameter, 18 mm.....each .12
per dozen 1.20

13400. **CULTURE TUBE FILLING DEVICE**, for measuring out exact quantities of culture media and other chemical fluids. Consists of a separatory funnel with three-way stop-cock, to one arm of which is attached a graduated side tube. Capacity, 250 cc..... 5.00

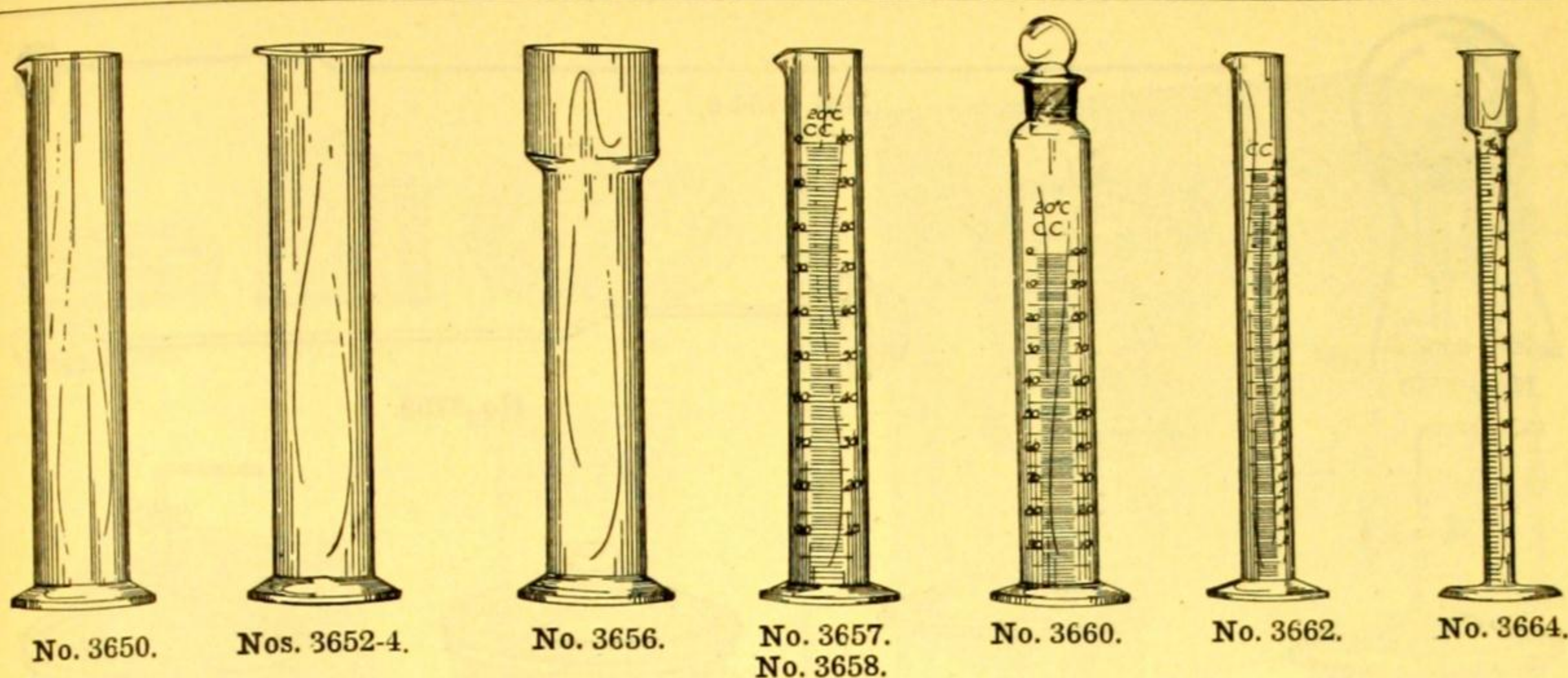
3628. **CUPELS, Bone Ash**, highly absorbent.

Diameter, inches	1¼	1½	1¾
Per dozen	.70	.85	1.00
Per 100	4.50	5.20	6.30

CUPEL HOLDER, see **Blowpipe Apparatus**.

CUPS, Annealing, see **Annealing Cups**.

CUPS, Porous, for use with batteries, see **Batteries**.

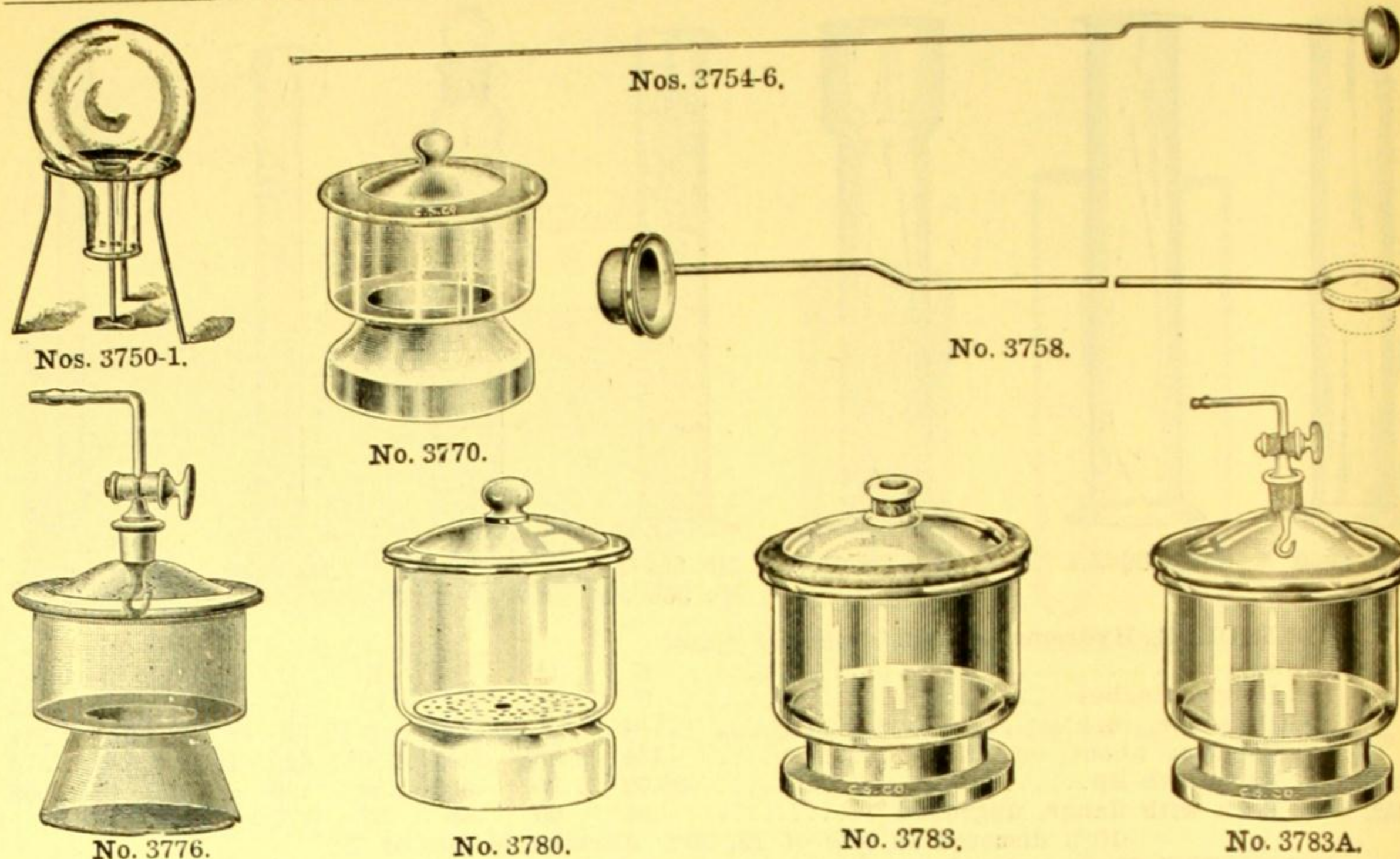


CYLINDERS, Hydrometer Jars, of heavy glass.									
	Size	B	C	D	E	F	H	J	K
	Height, inches	6	8	10	12	15	18	12	15
	Diameter, inches	1½	1½	1½	2	2	3	1½	1½
	Capacity about, cc.	135	190	245	550	625	1940	300	375
3650.	Each with lip	\$0.32	.35	.40	.50	.66	1.00	.45	.55
3652.	Each with flange, unground	.35	.40	.45	.57	.75	1.15		
10% discount in lots of 12, 20% discount in lots of 72.									
CYLINDERS, Hydrometer Jars, of heavy glass, with flange ground to take glass plate.									
3654.	Size		D		E		F		H
	Height, inches		10		12		15		18
	Diameter, inches		1½		2		2		3
	Each		.50		.85		1.15		1.65
10% discount in lots of 12, 20% discount in lots of 72.									
CYLINDERS, Hydrometer Jars, with enlarged top to prevent overflow.									
3656.	Size				A		B		C
	Height, inches				12		14		16
	Diameter of body, inches				1½		2		2
	Each				.62		.80		.90
10% discount in lots of 12, 20% discount in lots of 72.									
CYLINDERS, Graduated, with lip, tall shape as recommended by the Bureau of Standards.									
	Capacity, cc.	5	10	25	50	100	250	500	1000
	Graduated in, cc.	1/10	1/5	1/2	1	1	2	5	10
3657.	Each single graduated, zero at bottom	.60	.50	.45	.55	.60	.82	1.35	1.85
3658.	Each double graduated, zero at top and bottom	.70	.60	.55	.65	.80	1.00	1.55	2.25
10% discount in lots of 12, 20% discount in lots of 72.									
3660.	CYLINDERS, Graduated, Mixing Bottles, with glass stopper. With double graduations to read up and down. Capacity, cc.	10	25	50	100	250	500	1000	2000
	Graduated in, cc.	1/5	1/2	1	1	2	5	10	20
	Each	.95	.85	1.00	1.20	1.50	2.35	3.35	5.65
10% discount in lots of 12, 20% discount in lots of 72.									
3662.	CYLINDER, Graduated, for use with No. 7360 Brown-Duvel Moisture Tester. Graduated to 25 cc in 1/5. Height, 200 mm; diameter, 22 mm.								.60
10% discount in lots of 12.									
3664.	CYLINDER, Graduated, new design with enlarged top, for use with No. 7360 Brown-Duvel Moisture Tester. Reads directly in percentage of moisture up to 16 per cent., when 50 gram sample is used. Height, 195 mm; diameter, 10 mm. (See Bulletin 56 of the United States Department of Agriculture)								.90
10% discount in lots of 12.									
3668.	CYLINDERS, Graduated, Precision or Normal, with single graduations, to meet the requirements of United States Bureau of Standards as to size, shape and accuracy of calibration. Because of the stringent regulations of the Bureau of Standards regarding flaws and striae in the glass, we cannot guarantee that each piece sent in will be certified by the Bureau, although the utmost care has been used in the selection of the material and in the process of graduation, and we believe that they are equal in accuracy to any cylinders obtainable.								
	Capacity, cc.	10	25	50	100	250	500	1000	
	Graduated in, cc.	1/5	1/2	1	1	2	5	10	
	Each	2.50	3.00	3.50	4.00	5.00	6.00	7.00	
10% discount in lots of 12.									

GRADUATES, Conical, etc., see Graduates.

DESICCATORS

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.

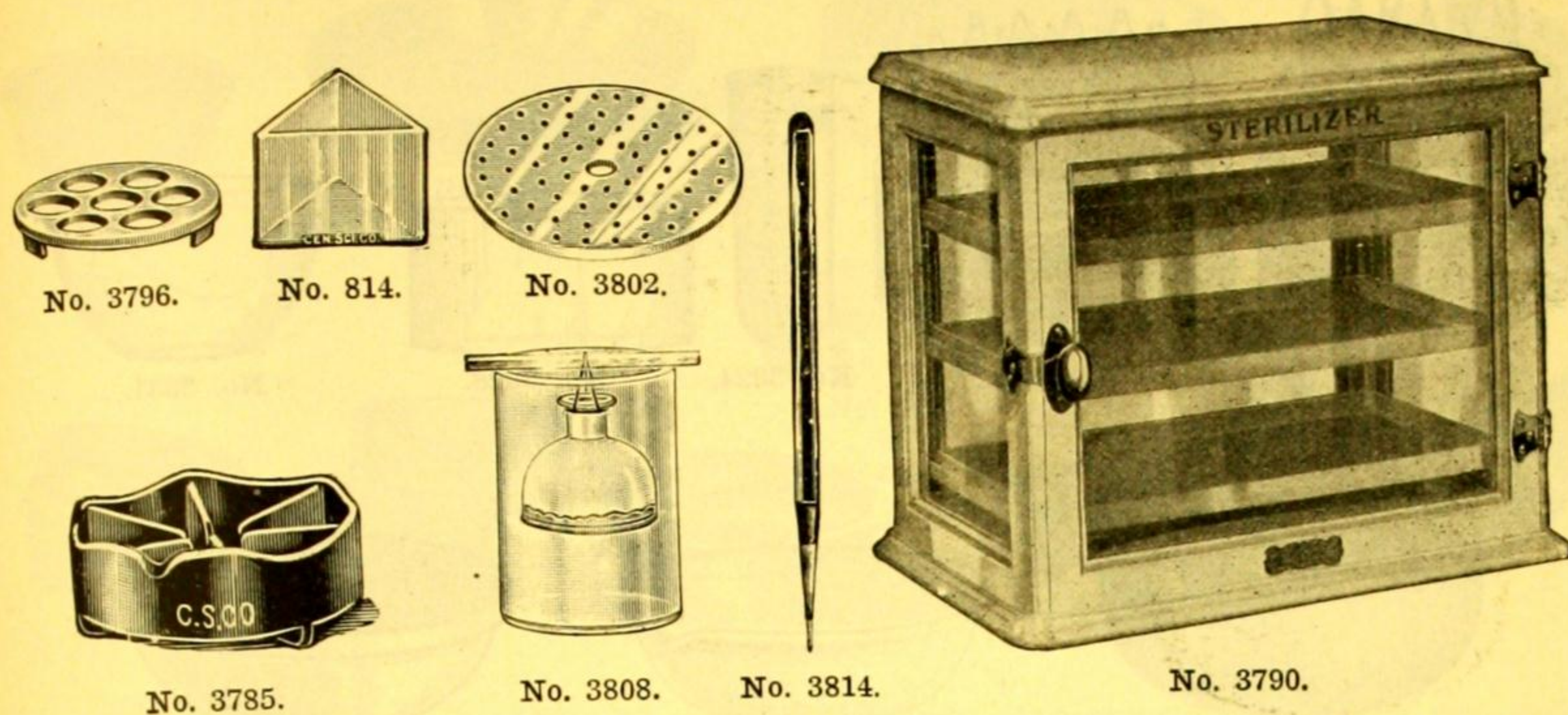


CYLINDERS, Calcium Chloride, see Calcium Chloride Jars.
 CYLINDERS, Nessler's, see Color Comparison Tubes.
 CYLINDERS, Steel, see Gases.
 CYLINDERS, Urinometer, see Urinometers.

3750. DEFLAGRATION GLOBE for combustions in oxygen. Diameter of globe, 9 inches; diameter of opening, 2 inches. Globe only..... \$1.50
 3751. SUPPORT and Cup for No. 3750..... 1.60
 3754. DEFLAGRATION SPOON, of iron, with $\frac{3}{4}$ inch cup. Length over all, 15 inches..... .07
 10% discount in lots of 12. 20% discount in lots of 144.
 3756. DEFLAGRATION SPOON, of brass, with $\frac{3}{4}$ inch cup. Length over all, 15 inches..... .10
 10% discount in lots of 12. 20% discount in lots of 144.
 3758. DEFLAGRATION AND COMBUSTION SPOON, Parker's, with removable $\frac{3}{4}$ inch cup which can be placed at one end for combustion and at the other for use in deflagrations. Total length, about 15 inches..... .15
 10% discount in lots of 12.
 DEFLAGRATION Spoons for Sodium, see Spoons.

DESICCATORS

3770. DESICCATORS, Scheibler, with wide flange and covers finely ground to fit.
 Diameter, inches 4 5 6 8 10
 Each 1.40 1.80 2.40 5.50 8.50
 10% discount in lots of 12.
 3772. DESICCATORS, Scheibler, for vacuum, same as No. 3770, but with tubulature in cover to take rubber stopper.
 Diameter inside, inches..... 6 8 10
 Each 5.00 8.00 12.00
 10% discount in lots of 12.
 3776. DESICCATORS, Scheibler, same as No. 3772, but with glass stop-cock and hook ground in tubulature in cover.
 Diameter inside, inches..... 6 8 10
 Each 7.50 10.00 15.50
 3780. DESICCATORS, Fruehling and Schultz, with porcelain plate profusely perforated with small holes.
 Diameter inside, inches..... 8 10
 Each 9.00 12.00
 3782. DESICCATORS, Fruehling and Schultz, same as No. 3780, but with glass stop-cock and hook ground in cover.
 Diameter inside, inches..... 8 10
 Each 10.00 18.00
 3783. DESICCATORS, Fruehling and Schultz, Pyrex, of extra heavy glass to withstand highest vacuum. Because of the superior resistance of Pyrex glass to both temperature changes and mechanical strains, and because of their extra thickness and careful design, we believe these desiccators



3783. DESICCATORS, Fruehling and Schultz, Pyrex.—Continued.

to be superior to any other type for vacuum work and recommend them heartily as an economical purchase, especially for industrial analytical laboratories. Diameter of desiccator at top inside, 210 mm; width of flange, 19 mm; height to shoulder outside, 50 mm; to top of flange, 195 mm; height over all, 270 mm, with tubulature in cover to take a No. 7 stopper. For use with Porcelain Plate No. 3802, 190 mm..... 12.50

3783A. DESICCATORS, Fruehling and Schultz, Pyrex, same as No. 3783, with ground-in Pyrex stop-cock and hook 18.00

3785. DESICCATOR DISHES, Acid Dishes, of porcelain. Diameter, 12 cm..... \$0.80

814. DESICCATOR, Triangular, for use in corner of balance case; of glass, 2 inches on a side, 1½ inches high80

3790. DESICCATOR CABINET, of glass, with wood frame carefully constructed to provide an airtight enclosure. Complete with three removable perforated steel trays. Finished in white enamel with nicked trimmings. Dimensions inside: length, 12¼ inches; height, 10¼ inches; depth, 7½ inches 16.25

3796. DESICCATOR PLATES, Porcelain, glazed on one side, with three small feet and with holes 30mm in diameter; for use in Sheibler Desiccators.

No.	1	2	3	4	5
Diameter, mm	95	115	140	190	230
Diameter, approximate inches.....	3¾	4½	5½	7½	9
Number of holes.....	3	4	5	7	8
Each	.90	1.02	1.50	2.40	3.00

3802. DESICCATOR PLATES, Porcelain, glazed on one side, without feet, profusely perforated with small holes, 5 mm in diameter.

Diameter, mm	140	190	230
Each	1.68	2.28	2.70

3808. DIALYZER, Bell Glass or Graham Form, consisting of open top bell glass, with large end covered with parchment paper, suspended in glass jar. Diameter of bell glass, 7.5 cm; size of glass jar, 5x7 inches 2.00

10040. DIALYZER PAPER, Parchment, of vegetable origin, medium thickness, in sheets 18x24 inches per sheet .10
..... per quire .50

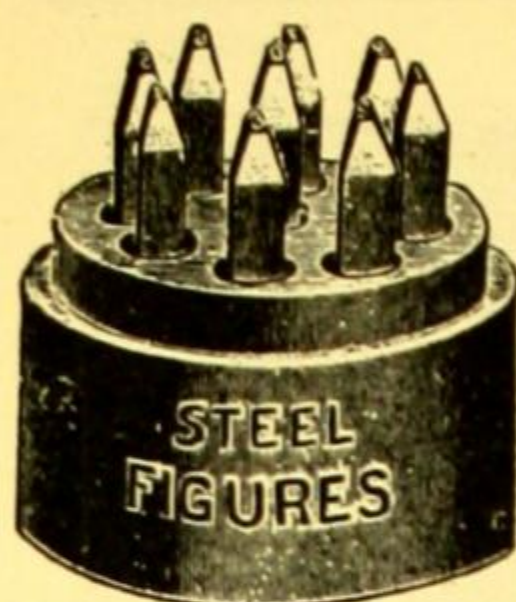
10042. DIALYZER PAPER, Parchment, genuine animal product in sheets 17x22 inches... per sheet 3.75

3814. DIAMOND for writing on glass, mounted in hard rubber handle..... 2.50

DIAMOND GLASS CUTTERS, see Glass Cutters.

3816. DIAMOND INK for writing on glass, in one ounce ceresine bottles..... .40

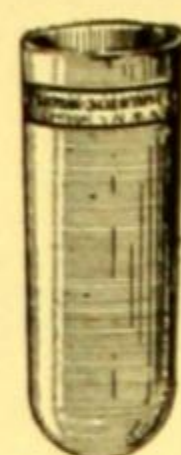
DIGESTERS, see Autoclaves.



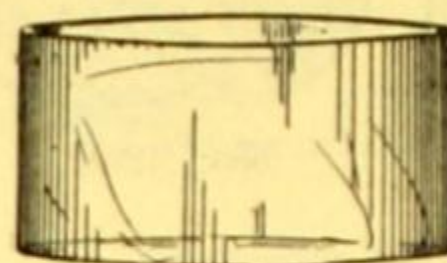
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No. 3822.



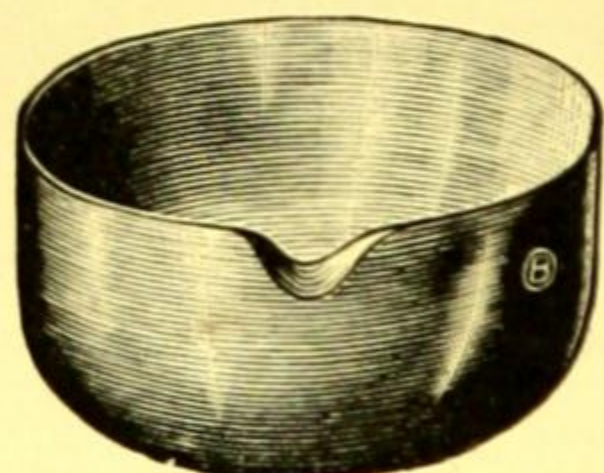
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No. 3828.



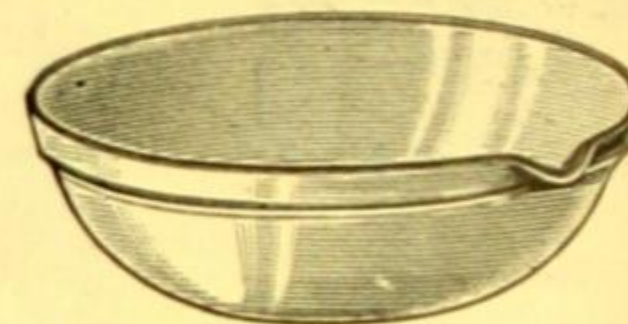
No. 3831.



No. 3829.



No. 3832.



No. 3834.

3820. **DIES, Figures**, of steel, from 0 to 9, for stamping steel, bullion, laboratory apparatus, etc.
 Face, inches $\frac{1}{8}$ $\frac{1}{4}$
 Per set \$1.20 2.00
3822. **DIES, Letters**, of steel, complete set from A to Z, and period, for stamping steel, bullion, laboratory apparatus, etc.
 Face, inches $\frac{1}{8}$ $\frac{1}{4}$
 Per set 3.40 5.75

DISHES, ALL KINDS

3824. **DIFFUSION SHELLS**, single thickness, for use in osmosis and dialysis experiments. These shells are superior to parchment paper either in sheets or tubing, because of their convenient shape, and large amount of dialysing surface. Length, 100 mm; diameter, 16 mm. In boxes of 25 shells.....per box 6.00

DISHES, Acid, see No. 3785.

DISHES, Aluminum, for milk analysis, see No. 3850.

3828. **DISHES, Crystallizing**, of thin blown glass, with flat bottom, straight sides, and ground edges.
- | No. | A | AA | B | C | D | E | F |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| Approx. diameter, mm..... | 50 | 60 | 80 | 100 | 125 | 150 | 190 |
| Approx. depth, mm..... | 35 | 35 | 40 | 50 | 65 | 75 | 95 |
| Each | .16 | .18 | .20 | .25 | .36 | .50 | .80 |

10% discount in lots of 12, 20% discount in lots of 144.

DISH, Crystallizing, for Tan Liquors, see No. 3873.

3829. **DISH, Evaporating Copper**, $3\frac{1}{2}$ inch in diameter, 200 cc..... 1.10

DISHES, Culture, see Culture Dishes.

3831. **DISHES, Evaporating, Pyrex Glass**, flat bottom, heavy walled, with lip; may be used instead of porcelain.

No.	A	B	C	D
Diameter, mm	80	90	105	125
Height, mm	45	50	55	65
Each	.35	.40	.45	.75

3832. **DISHES, Evaporating, Coors Porcelain**, with lip, glazed inside and outside up to No. 4A; larger sizes glazed inside, but only partly outside.

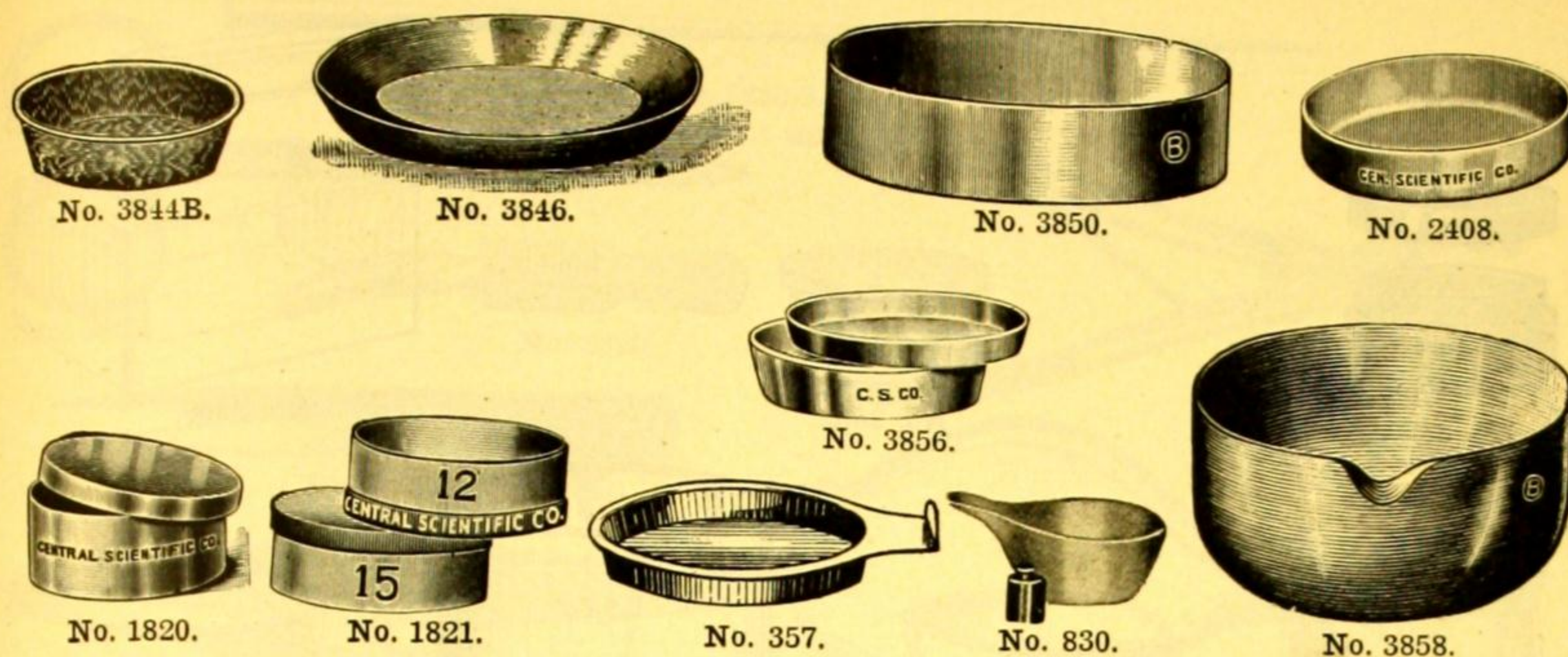
No.	000	00A	2	3	4A	6	8	9
Diameter, mm	60	75	90	100	115	145	215	265
Capacity, cc.....	35	70	140	175	250	385	1285	2200
Each	.14	.23	.42	.48	.60	.84	1.44	2.16

3834. **DISHES, Evaporating, Coors Porcelain**, glazed inside, but only partly outside, with heavy welted rim and lip. No.....

No.	11	12	13
Diameter, mm	360	400	460
Approximate capacity, cc.....	5700	10000	16500
Each	6.40	14.40	24.00

3842. **DISHES, Evaporating, Opaque Fused Silica**, round bottom, glazed throughout, with lip. Not affected by sudden or extreme changes of temperature, nor by ordinary reagents.

No.	B	C	E	F
Diameter, mm	70	82	98	108
Depth, mm.....	25	30	30	44
Approximate capacity, cc.....	45	80	100	200
Each	1.50	1.65	2.15	2.50



3844B DISH, Graniteware, flat bottom, with sloping sides. Approximate diameter, 18 cm; manufacturer's rated capacity, 1 quart..... \$0.20

DISHES, Iron, see Sand Baths.

3846. DISHES, Lead, for use with hydrofluoric acid in etching glass.

Diameter, mm.....	50	75	100
Each	.09	.14	.18

10% discount in lots of 12, 20% discount in lots of 144.

3850. DISHES, Milk, Aluminum, with straight sides and flat bottom.

No.	A	B	C	D
Diameter, mm	50	65	75	100
Depth, mm	12	15	20	25
Each	.15	.20	.25	.30

10% discount in lots of 12.

2408. DISH, Milk, Coors Porcelain, with straight sides and flat bottom, glazed inside and outside. Diameter outside, 69 mm; depth, 13 mm; capacity, 25cc..... .42

1820. DISHES, Moisture, Aluminum, with cover of same fitting outside. Cover can be fitted on bottom to keep parts together when dish is open. Extensively used in soil laboratories for determining moisture.

No.	A	B	C
Diameter, mm	50	63	89
Height, mm	22	44	50
Each	.25	.40	.60

10% discount in lots of 12.

1821. DISHES, Moisture, Aluminum, same as No. 1820, but with dish and cover numbered to agree. In ordering please state what numbers are desired.

No.	A	B	C
Each	.35	.50	.70

10% discount in lots of 12.

3856. DISH, Moisture, Aluminum, with flat bottom, sloping sides, and inverted cover fitting tightly on inside. Diameter at top, 55 mm; height, 15 mm..... .35
10% discount in lots of 12.

3858. DISHES, Nickel, spun from pure sheet, polished; round bottom, with lip.

No.	B	C
Diameter, mm	60	80
Capacity, cc	100	200
Each	1.40	2.00

357. DISH, Nickel, Evaporating, with handle, as used by the Barrett Company in testing bituminous materials. Also used for drying in sugar analysis. Diameter, 54 mm; depth, 14 mm..... 2.10

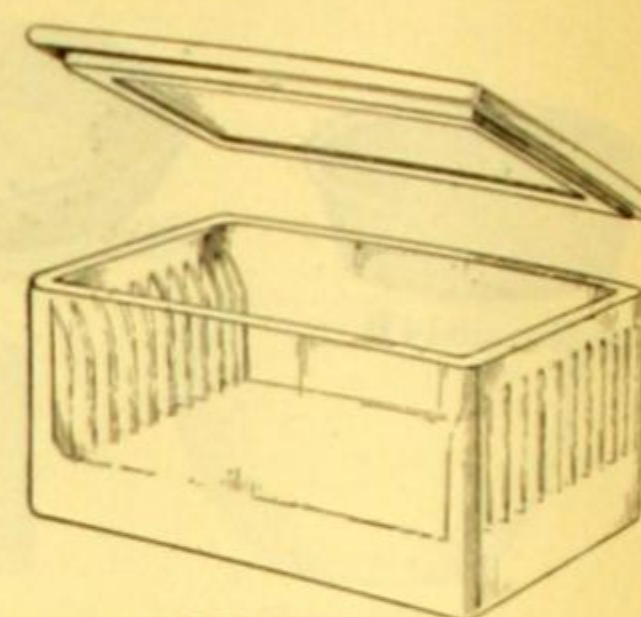
830. DISH, Nickel, Weighing, for Sugar, with spout and counterpoise. Diameter of dish, 80 mm; total length including spout, 120 mm; depth, 40 mm. Highly polished, with brass counterpoise. (See Browne's Handbook of Sugar Analysis, Page 203)..... 6.00



No. 3860.



No. 3862.



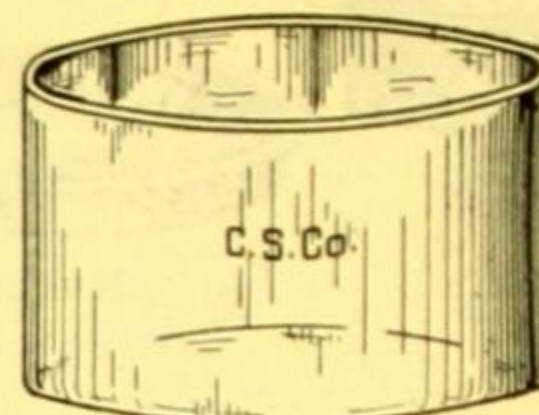
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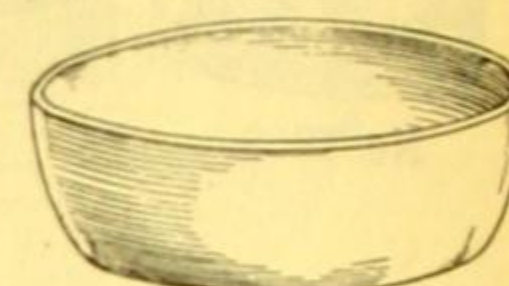
No. 3870.



No. 3872.



No. 3873.



No. 3874.

DISHES, Platinum, see Platinum Ware.

3860. DISHES, Preparation, of clear white glass, low form, with loose fitting cover.

No.	A
Outside diameter at bottom, mm.	50
Height, including cover, mm.	30
Each	\$0.30

10% discount in lots of 12.

3862. DISHES, Preparation, Stender Dishes, with grooved covers ground to fit.

No.	A	B	C	D
Outside diameter at top of dish, mm.	36	50	60	60
Height without cover, mm.	19	25	28	90
Each	.22	.26	.40	.40

10% discount in lots of 12.

3868. DISH, Staining, of glass, with cover and grooves to hold ten 3 inch slides. Length outside, 3 $\frac{5}{8}$ inches; width outside, 2 $\frac{5}{8}$ inches.40

10% discount in lots of 12.

3870. DISH, Staining, Embryological Cup, of solid glass with concavity in center, with one surface ground for writing. Dimensions 38x38x17 mm, with concavity 33 mm in diameter and 11 mm deep

10% discount in lots of 12.

DISHES, Staining, Syracuse Watch Glasses, see Watch Glasses.

STAINING JARS, see Jars, Staining.

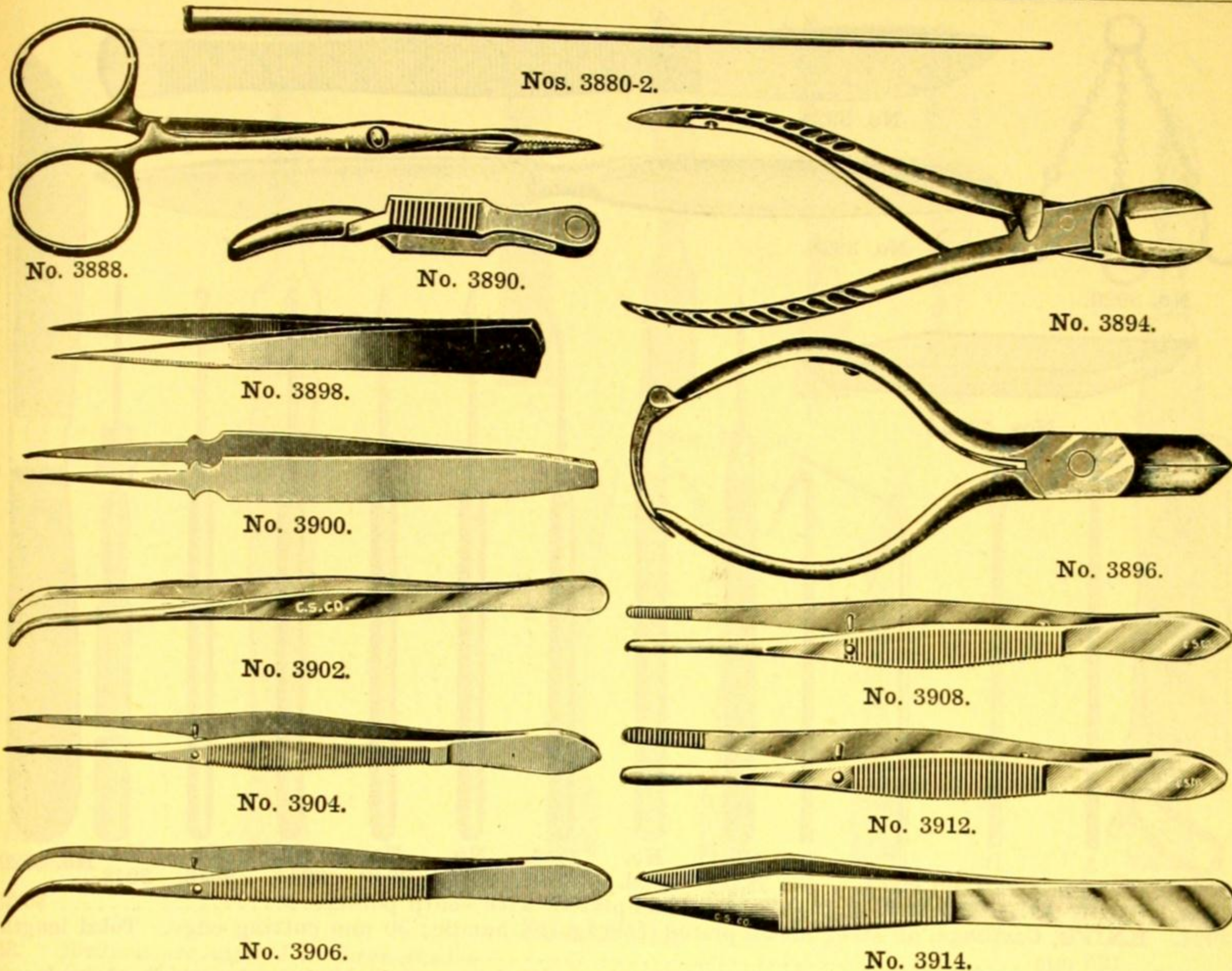
DISHES, Stender, see Dishes, Preparation.

3872. DISH, Sugar, Opaque Fused Silica, flat bottom, without lip. Diameter, 51 mm; depth in center, 25 mm; approximate capacity, 40cc. 1.65

3873. DISH, Tan Liquor, Pyrex, with fire-polished edge, for use in the evaporation and drying of residues in the analysis of tan liquors. Diameter, 70 mm; height, 50 mm; weight, approximately, 35 grams. (See Official Method of the American Leather Chemists Association for the analysis of Vegetable Materials Containing Tannin, Vol. IV, page 21.)45

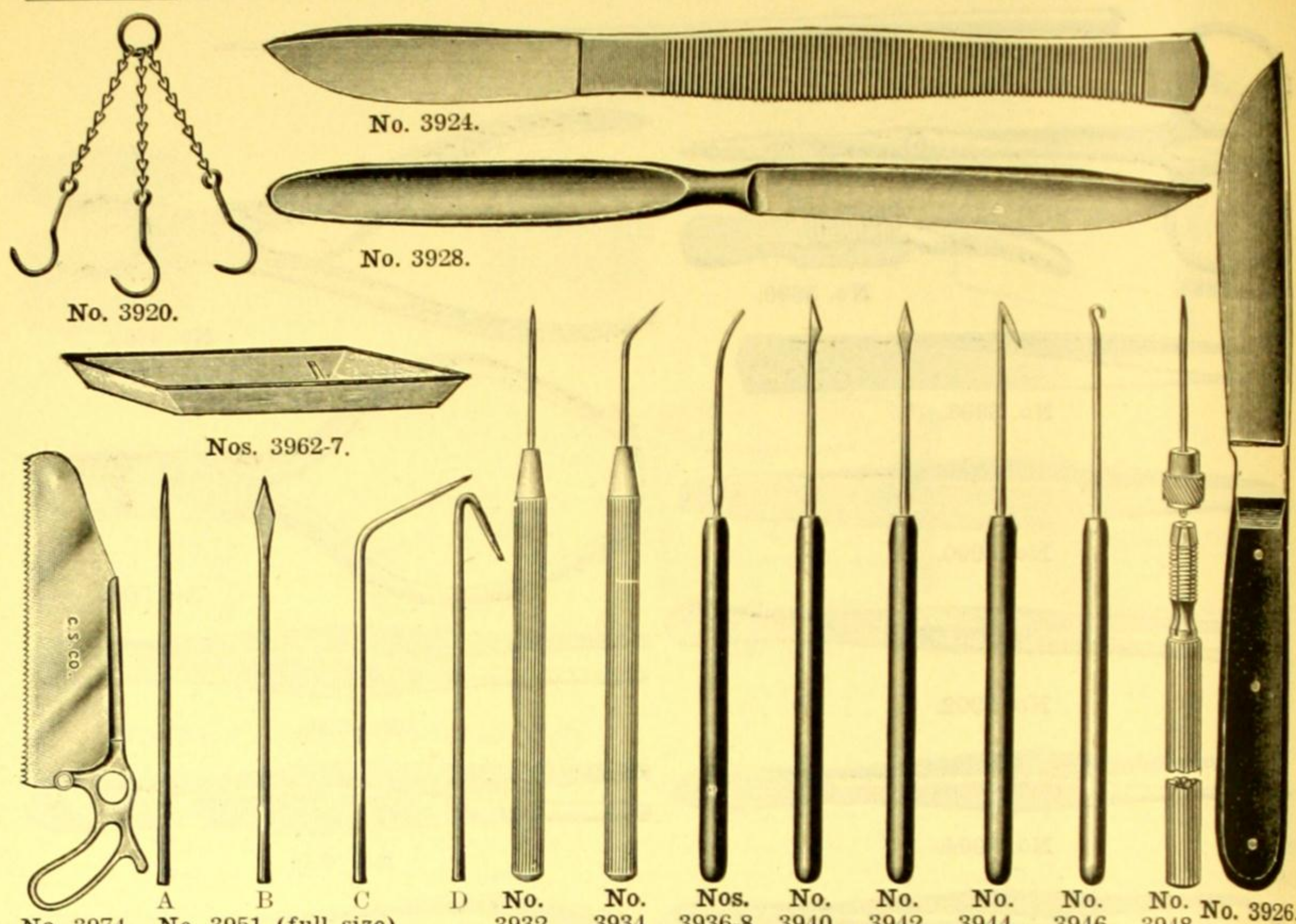
3874. DISH, Tannin, Opaque Fused Silica, flat bottom, without lip. Used also for ashing coal. Diameter, 82 mm; depth in center, 25 mm; approximate capacity, 75 cc. 1.65

DISHES, Weighing, see Balance Weighing Scoops.



DISSECTING INSTRUMENTS

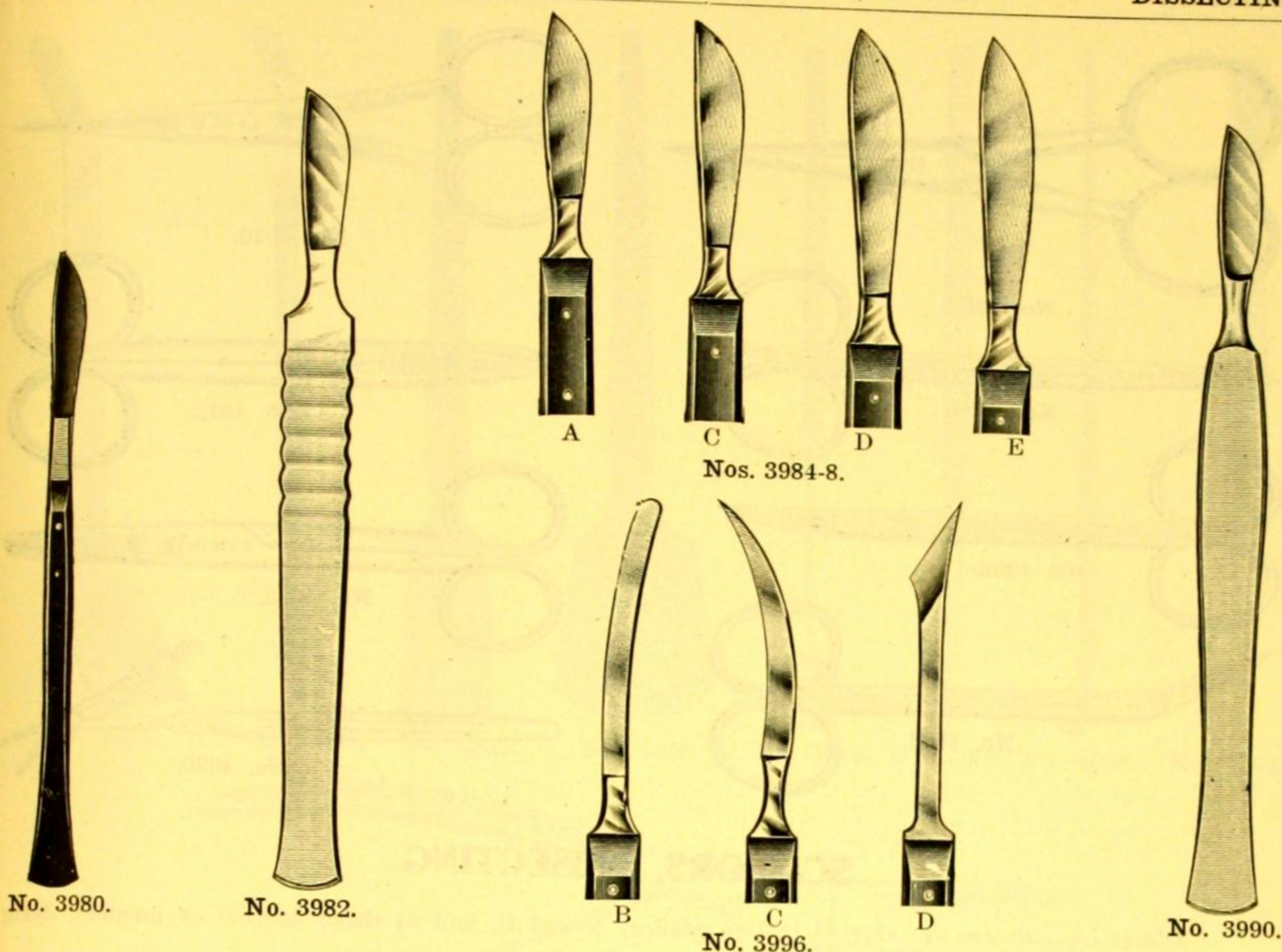
3880. **BLOWPIPE** for zoological work, nickel-plated, 125 mm long..... \$0.22
10% discount in lots of 12, 20% discount in lots of 144.
3882. **BLOWPIPE** for zoological work, nickel-plated, 188 mm long with very small orifice; especially suited for very small vessels..... .35
10% discount in lots of 12, 20% discount in lots of 144.
3884. **BRISTLES**, shoemaker's. Extra quality; useful as seekers for tracing out fine ducts and vessels..... per 100 .40
3888. **FORCEPS**, Artery, Dressing Forceps, of steel, nickel-plated, with corrugated jaws. Length, 115 mm..... 1.20
3890. **FORCEPS**, Artery, Dieffenbach's, self-closing, of steel, nickel-plated, with corrugated curved jaws. Length, 60 mm..... .70
3894. **FORCEPS**, Bone Cutting, of steel, nickel-plated, very heavy and strong. The blades fit accurately and are easily separable for cleaning. Length, 190 mm..... 3.20
3896. **FORCEPS**, Bone Cutting, of steel, nickel-plated, with strong curved blades. Length, 100 mm..... 1.00
3898. **FORCEPS**, Dissecting, Fine, of steel, nickel-plated, with smooth handles; fine, straight, smooth points. Length, 110 mm..... .15
3900. **FORCEPS**, Dissecting, Fine, of steel, with smooth handles; fine, straight, smooth points. Length, 95 mm..... .25
3902. **FORCEPS**, Dissecting, Fine, of steel, nickel-plated, with smooth handles; fine, curved, file-cut points. Length, 120 mm..... .55
3904. **FORCEPS**, Dissecting, Fine, of steel, nickel-plated, with corrugated handles; fine, straight, file-cut points, with guide pin. Length, 115 mm..... .50
3906. **FORCEPS**, Dissecting, Fine, of steel, nickel-plated, with corrugated handles; fine, curved, file-cut points, with guide pin. Length, 115 mm..... .60
3908. **FORCEPS**, Dissecting, Medium, of steel, nickel-plated, with corrugated handles; medium fine, straight, corrugated points, with guide pin. Length, 115 mm..... .60
3912. **FORCEPS**, Dissecting, Heavy, of steel, nickel-plated, with corrugated handles; heavy, straight, corrugated points, with guide pin. Length, 115 mm..... .55
3914. **FORCEPS**, Dissecting, Heavy, of steel, nickel-plated, with corrugated handles; heavy, straight, file-cut corrugated points, without guide pin. Length, 125 mm..... .50
- FORCEPS**, Blowpipe, Cover Glass, Pinning, Weight, etc., see general heading, Forceps.
- Note—10% discount in lots of 12, 20% discount in lots of 144 from list prices of forceps Nos. 3888 to 3914.



- No. 3974. No. 3951 (full size).
 3920. **HOOK AND CHAINS**, triple hooks, nickel-plated, with sharp points. \$0.35
 3924. **KNIFE**, Cartilage, all steel, nickel-plated, corrugated handle; 50 mm cutting edge. Total length, 165 mm .55
 3926. **KNIVES**, Cartilage, Heavy, Prosecting Knives, with heavy steel blade, extra thick at back, set in ebony handle. Length of cutting edge, mm .70 90
 Each .1.65 2.00
 3928. **KNIFE**, Cartilage, Large, all steel, with flat ground blade, 135 mm long. Suitable for cartilage work and large dissections. Total length, 250 mm .3.20
 10% discount in lots of 12, 20% discount in lots of 144 from Nos. 3920-24-26-28.
 3932. **NEEDLE**, Dissecting, of steel with plain wood handle 110 mm long; with straight sharp point. Length, 130 mm. per dozen .45
 10% discount in lots of 144.
 3934. **NEEDLE**, Dissecting, same as No. 3932, but with bent sharp point. per dozen .50
 10% discount in lots of 144.
 3936. **NEEDLE**, Dissecting, best quality, with curved sharp point. .30
 3938. **NEEDLE**, Dissecting, same as No. 3936, but with curved blunt point. .30
 3940. **NEEDLE**, Dissecting, same as No. 3936, but with half spear point. .50
 3942. **NEEDLE**, Dissecting, with full spear point, with double cutting edge. .50
 3944. **NEEDLE**, Dissecting, with harpoon shaped point, with two cutting edges. .70
 3946. **NEEDLE**, Dissecting, hook shaped. .50
 3948. **NEEDLE HOLDER**, of brass, nickel-plated, with screw chuck, with one straight needle. Length, 85 mm .12
 3950. **NEEDLE HOLDER**, same as No. 3948, but with one bent needle. .12
 10% discount in lots of 12, 20% discount in lots of 144 from Nos. 3936-50.
 3951. **NEEDLES**, of steel, for use with Nos. 3948 and 3950 Holders, Length, 50 mm.

Style	A	B	C	D
Known as	straight	spear	bent	hook
Per dozen	.10	.50	.50	.50

 10% discount in lots of 144.
OIL STONE for sharpening scalpels and knives, see Nos. 9608 to 9612.
 3962. **PAN**, Dissecting, of heavy tinned metal, japanned, with metal loops for fastening limbs of animals during dissection. Dimensions, 290x190x30 mm deep. .40
 3963. **PAN**, Dissecting, same as No. 3962, but with bottom covered with wax, to which small objects may be pinned. .50
 3966. **PAN**, Dissecting, of seamless agateware. Dimensions, 300x200x30 mm deep. .40
 3967. **PAN**, Dissecting, same as No. 3966, but with bottom covered with cork, to which small objects may be pinned. .80
 10% discount in lots of 12 from Nos. 3962-67.
RAZORS, Section, see Microtome Knives.
 3974. **SAW**, Bone, of steel, nickel-plated, parts separable for sterilization. Length of blade, 200 mm; total length, 300 mm. 3.75



SCALPELS

Scalpels are carried in three grades.

Grade C is made from a good grade of steel, carefully ground and sharpened. They are suitable for the ordinary elementary laboratory work of the student.

Grade B is made from carefully selected steel evenly honed. They are well finished, and can be used for the more advanced laboratory work by either student or instructor.

Grade A is made of the best English steel, tempered with the greatest care. The blades are hollow ground and finely honed. They will take and retain an edge such as is demanded for the most delicate dissections. They can be used in the most precise work in the private or research laboratory.

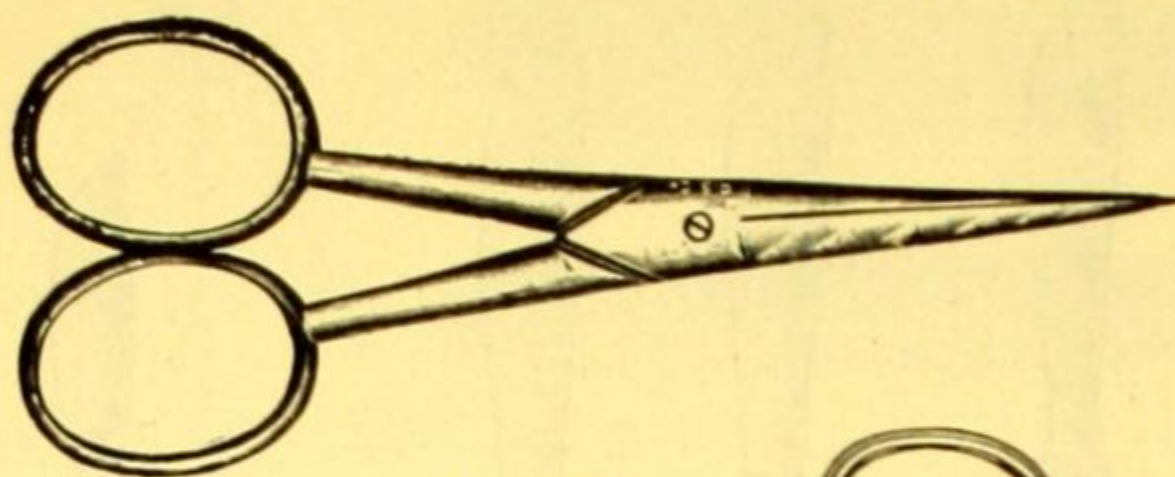
SCALPELS, REGULAR SHAPE

3980.	SCALPELS, Grade C, with black wood handles.			
	No.			B
	Length of cutting edge, mm.			38
	Each			\$0.30
3982.	SCALPELS, Grade C, all steel, easily sterilized.			
	No.			B
	Length of cutting edge, mm.			38
	Each			.55
3984.	SCALPELS, Grade B, with ebony handles.			
	No.	A	C	D
	Length of cutting edge, mm.	25	38	45
	Each	.60	.60	.60
3988.	SCALPELS, Grade A, with ebony handles.			
	No.	A	C	D
	Length of cutting edge, mm.	25	38	45
	Each	.80	.80	.80
3990.	SCALPELS, Grade A, all steel, easily cleaned and sterilized.			
	No.	A	C	D
	Length of cutting edge, mm.	25	38	45
	Each	.80	.80	.80

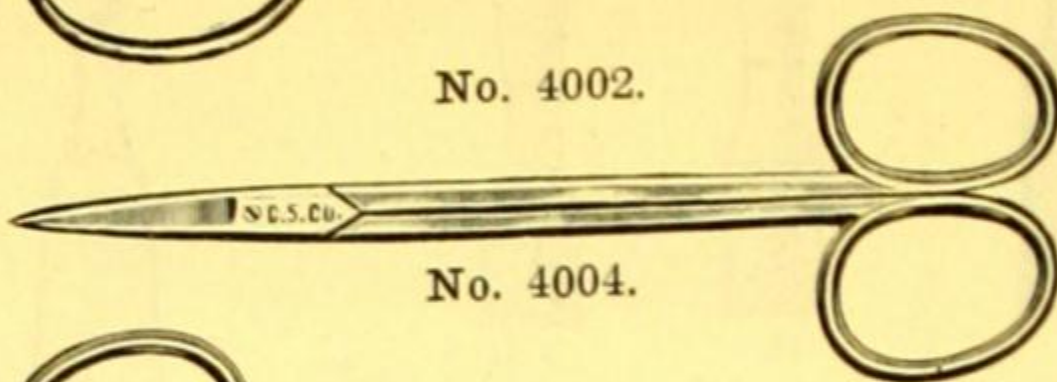
SCALPELS, SPECIAL SHAPES

3996.	SCALPELS, Grade A, with ebony handles.			
	Style	B	C	D
	Length of cutting edge, mm.	35	35	10
	Each	.80	.80	.80

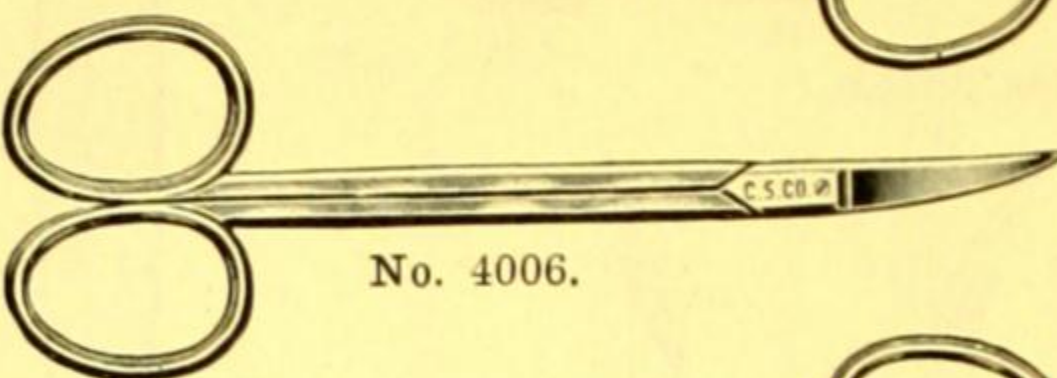
Note—10% discount in lots of 12, 20% discount in lots of 144 from all list prices on this page.



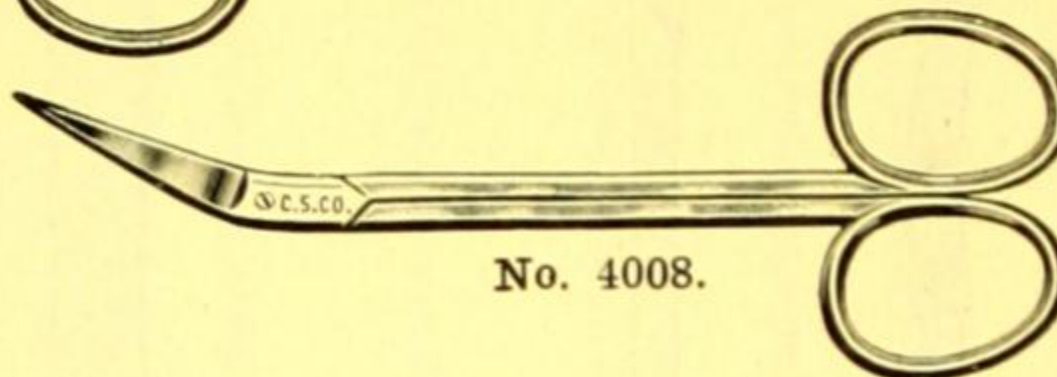
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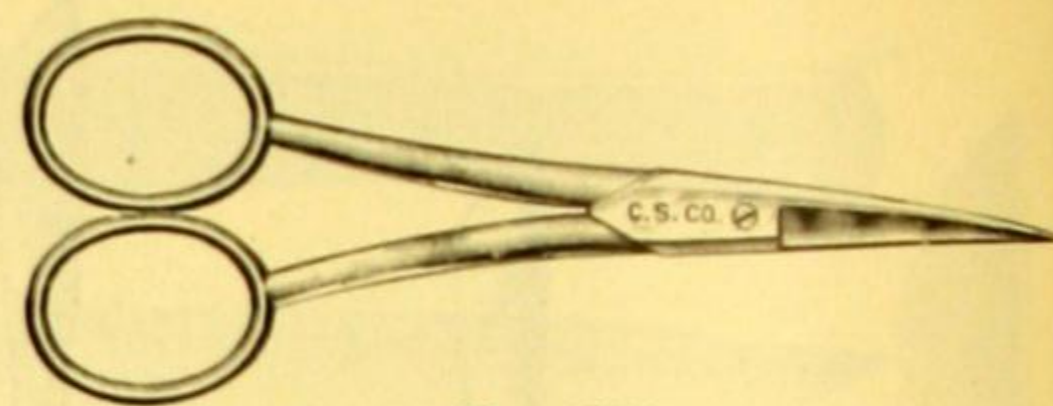
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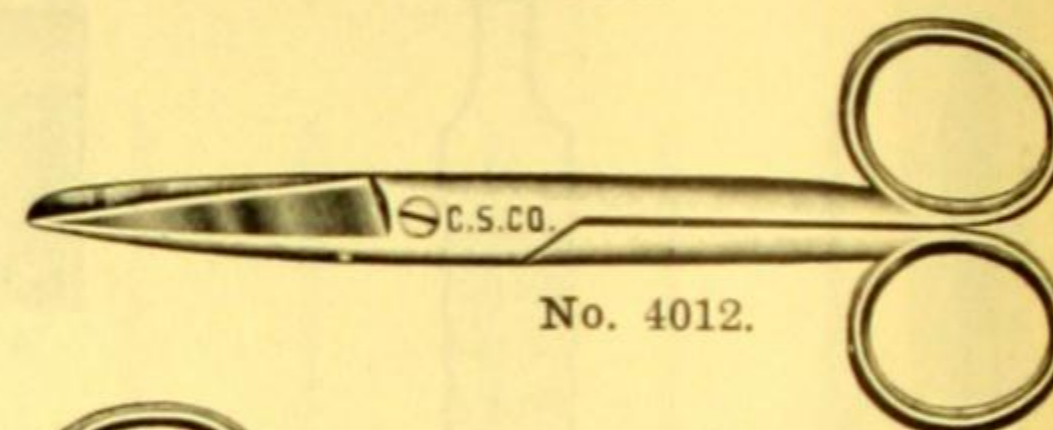
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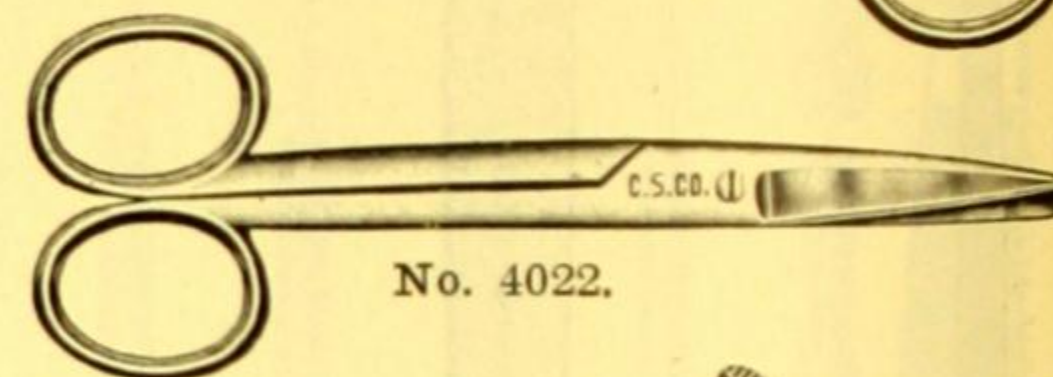
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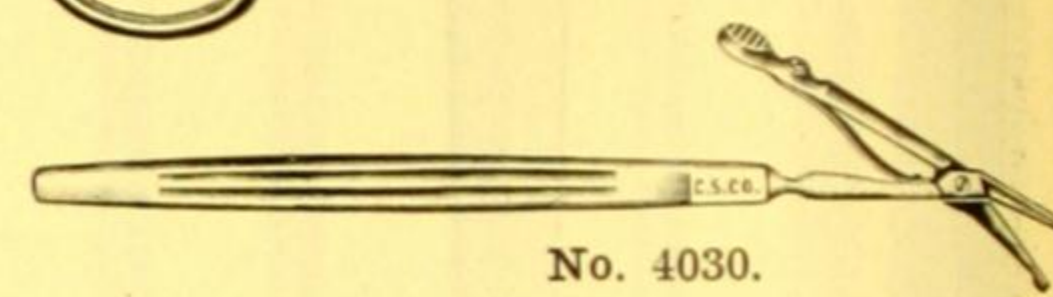
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No. 4012.



No. 4022.



No. 4030.

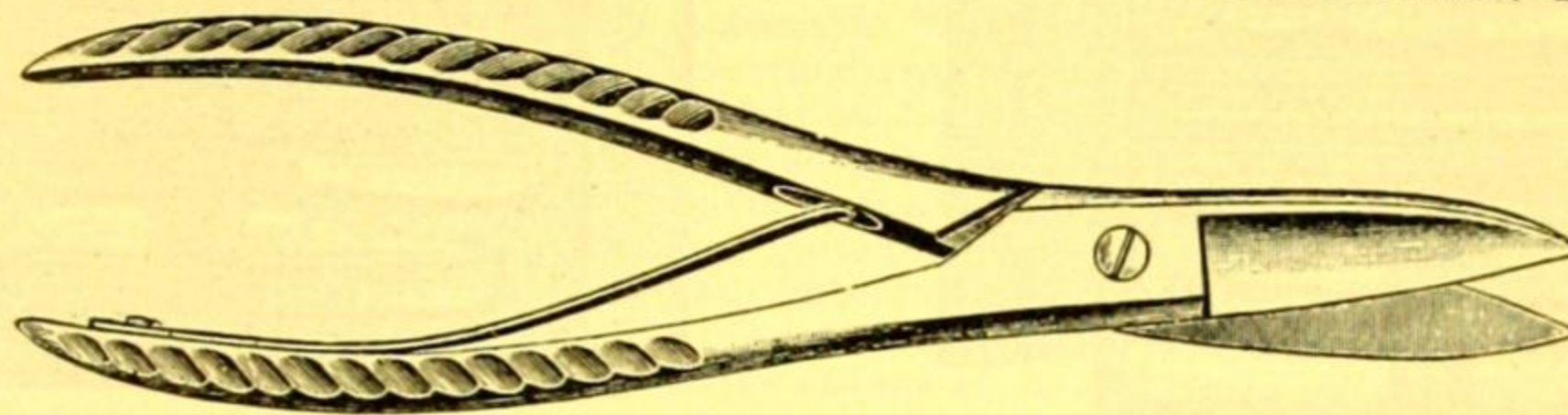
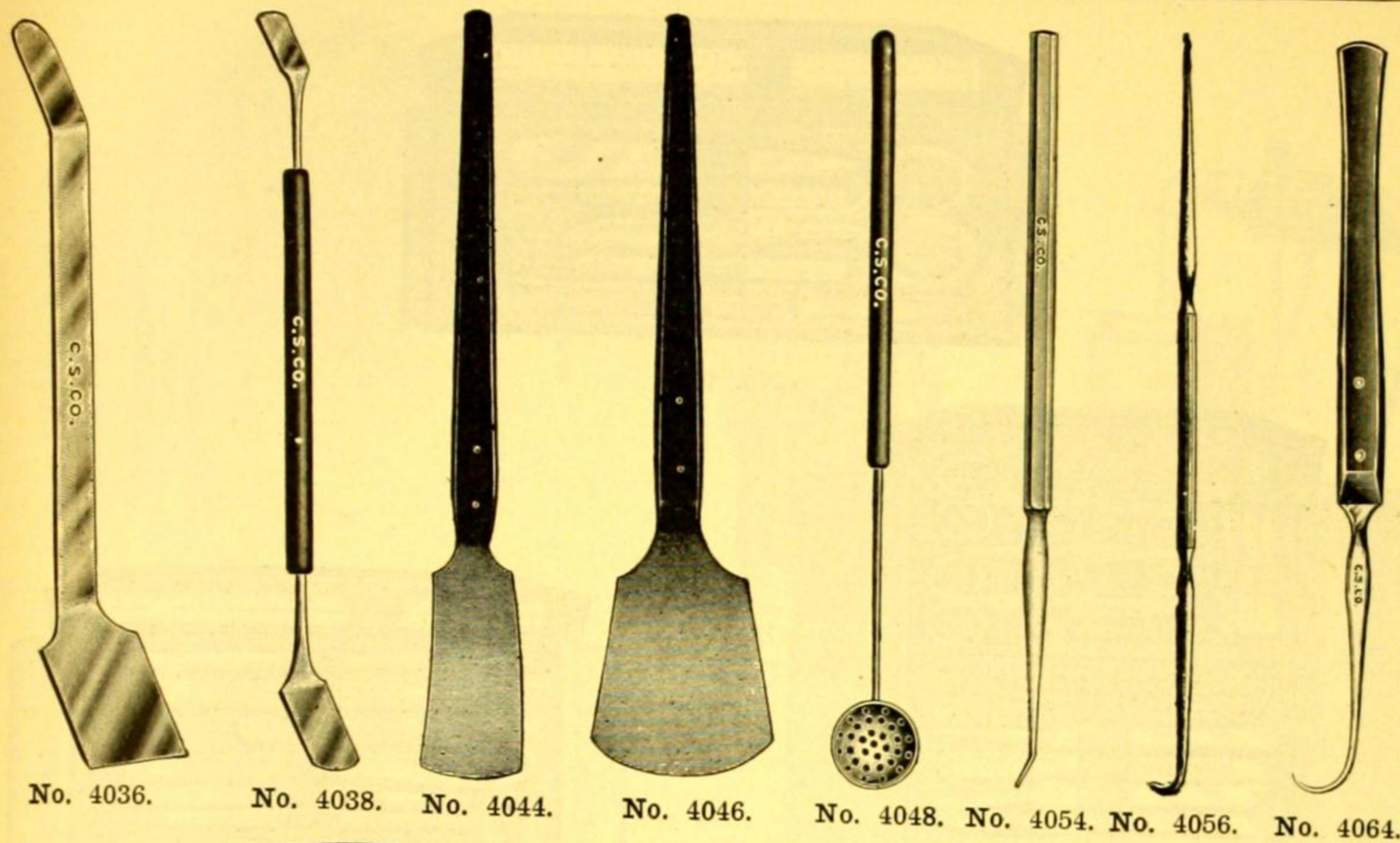
SCISSORS, DISSECTING

Dissecting scissors are carried in two grades, A and B, and in three degrees of fineness, designated as fine, medium and heavy.

Grade B scissors are made of ordinary cutlery steel, and are suitable for ordinary student laboratory work.

Grade A scissors are made of the best grade of cutlery steel, nickel-plated, and are suitable for precise and delicate work in the advanced and research laboratory.

4002. **SCISSORS, Grade B, Heavy**, nickel-plated, with screw lock, with straight, sharp points. Length, 125 mm \$0.50
10% discount in lots of 12, 20% discount in lots of 144.
4004. **SCISSORS, Grade A, Fine**, with screw lock. Fine, straight, sharp points. Length, 110 mm. .80
10% discount in lots of 12, 20% discount in lots of 144.
4006. **SCISSORS, Grade A, Fine**, with screw lock. Fine, sharp points, curved upwards. Length, 110 mm 1.00
10% discount in lots of 12, 20% discount in lots of 144.
4008. **SCISSORS, Grade A, Fine**, with screw lock. Fine, sharp points bent at angle to side. Length, 110 mm 1.25
10% discount in lots of 12, 20% discount in lots of 144.
4010. **SCISSORS, Grade A, Medium**, with screw lock. Medium fine, straight, sharp points. Length, 115 mm80
10% discount in lots of 12, 20% discount in lots of 144.
4012. **SCISSORS, Grade A, Heavy**, with screw lock. Heavy, straight points, one sharp and one blunt.
- | No. | A | C | D |
|------------|------|------|------|
| Length, mm | 125 | 150 | 175 |
| Each | 1.10 | 1.20 | 1.50 |
- 10% discount in lots of 12, 20% discount in lots of 144.
4022. **SCISSORS, Grade A, Heavy**, with slide lock. Heavy straight points, one sharp and one blunt.
- | Length, mm | 115 | 125 |
|------------|------|------|
| Each | 1.00 | 1.40 |
- 10% discount in lots of 12, 20% discount in lots of 144.
4030. **SCISSORS, Invertebrate Dissecting**, for the most delicate work. Very fine, sharp points, with all metal handle. Length of cutting edge, 10 mm; total length of scissors, 140 mm..... 4.00

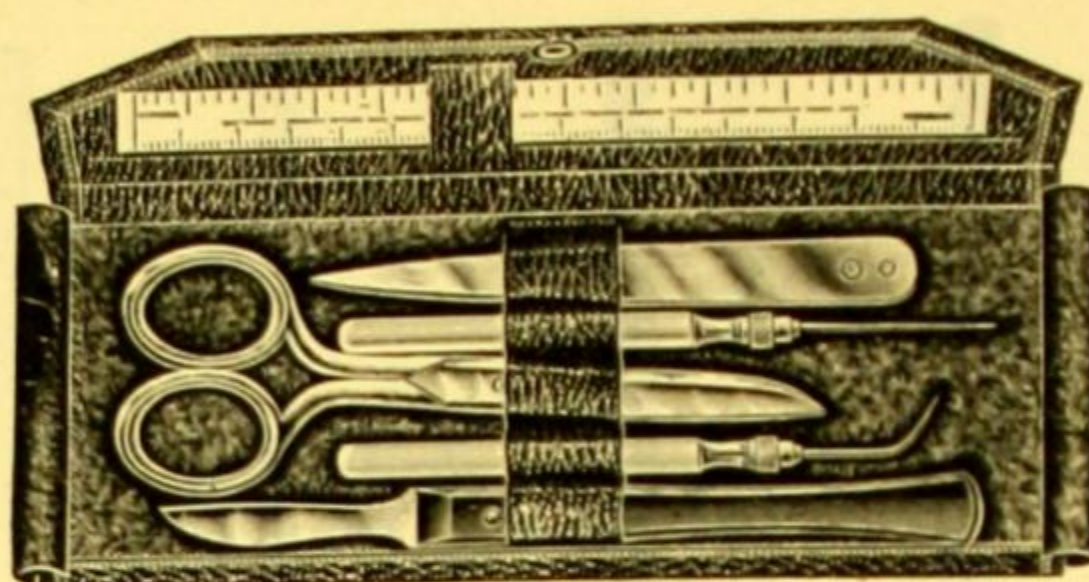


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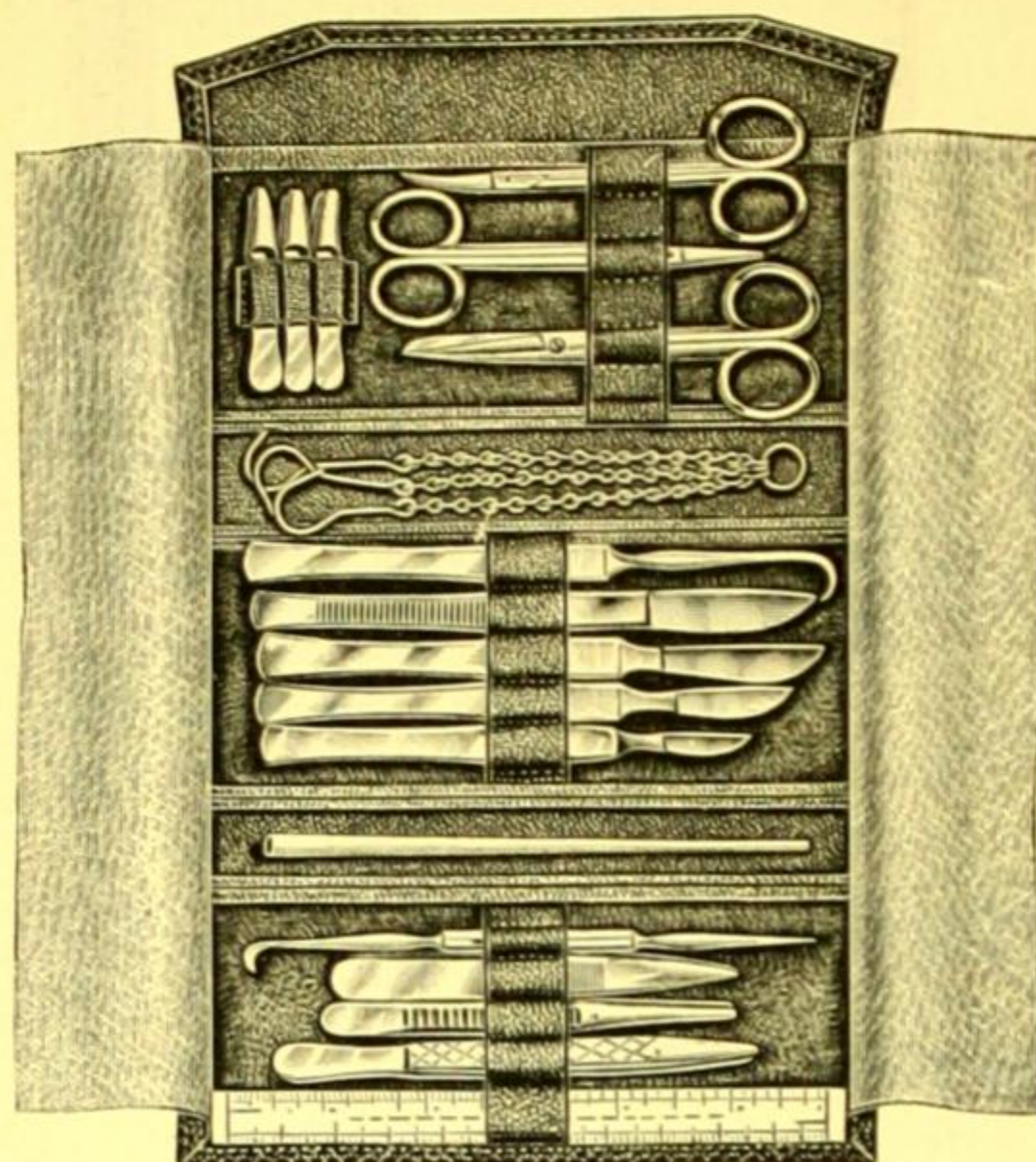
4036. **SECTION LIFTER**, of German silver, with blade 16x18 mm; total length, 100 mm..... \$0.22
4038. **SECTION LIFTER**, with two German silver blades, set in ebony handle. Width of large blade, 10 mm; width of small blade, 6 mm..... .70
4044. **SECTION LIFTER**, with ebony handle and thin, flexible, German silver blade, 20 mm wide .65
4046. **SECTION LIFTER**, with ebony handle and thin, flexible, German silver blade, 38 mm wide .70
4048. **SECTION LIFTER**, with ebony handle and perforated bowl 18 mm in diameter, for handling delicate specimens60
- SECTION RAZORS**, see **Microtome Knives**.
4054. **SEEKER** or **Probe**, all steel, nickel-plated, with octagonal handle and bent, blunt point, as used in the anatomical laboratory of the University of Chicago. Length, 145 mm..... .35
4056. **SEEKER** or **Probe**, all steel, nickel-plated, with hexagonal handle. One end terminates in a fine, sharp point, while the other is curved, with sharp edge and sharp point. Length, 155 mm .50
4060. **SHEARS**, Cartilage, of steel, nickel-plated, with screw joint. Length of cutting edge, 60 mm; total length of shears, 230 mm..... 3.35
4064. **TENACULUM**, ebony handle, steel shank, with tapering sharp hook. Length, 160 mm.... .55
10% discount in lots of 12, 20% discount in lots of 144 from list price of Nos. 4036-4064.

DISSECTING INSTRUMENT CASES

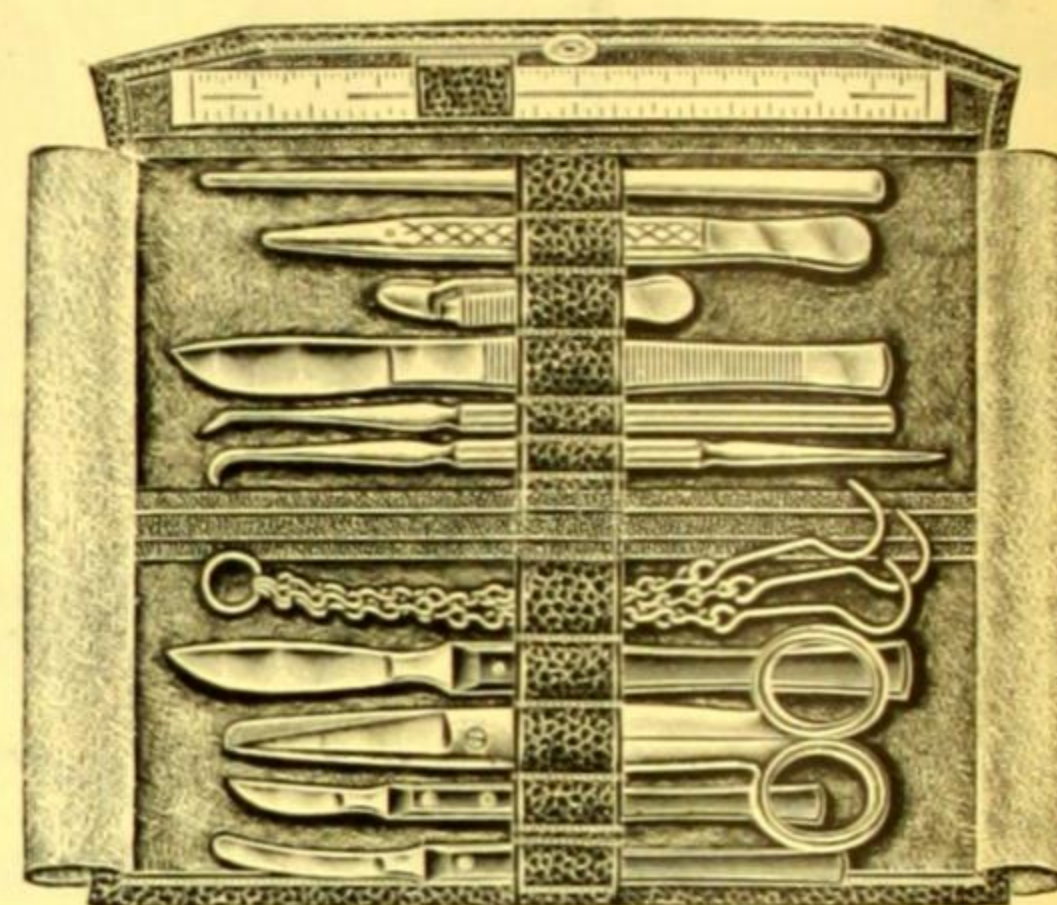
4072. **DISSECTING CASE**, Leatherette, of best quality brown leatherette, almost equal to leather in appearance and durability, single-fold, lined with heavy cloth, and having cloth flaps, button fastener, and loops for 6 instruments..... .35
10% discount in lots of 12, 20% discount in lots of 144.
4076. **DISSECTING CASE**, Morocco, of genuine morocco leather, two-fold, lined with velvet, and having chamois flaps, button fastener, and leather loops for 11 instruments..... 2.50
10% discount in lots of 12.
4078. **DISSECTING CASE**, Morocco, similar to No. 4076, but three-fold, with loops for 17 instruments 3.60
10% discount in lots of 12.



No. 4086.



No. 4098.

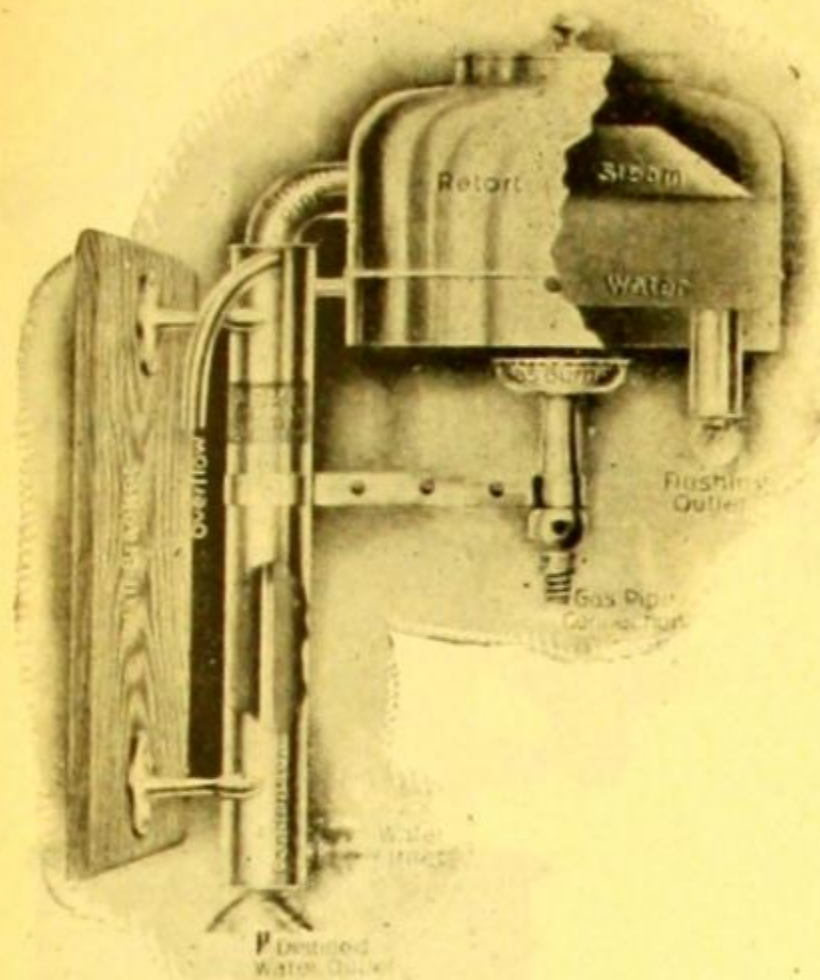


No. 4100.

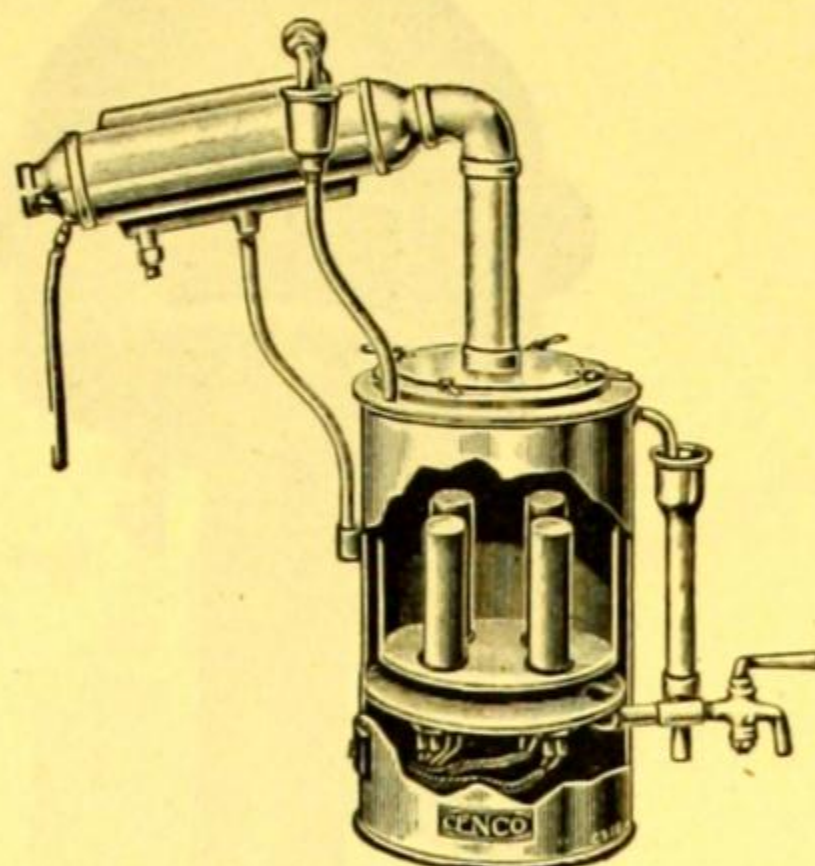
DISSECTING INSTRUMENTS IN SETS

The following sets have been made up of the instruments which have proved most popular for work in botany, zoology, anatomy, and histology. We will make up special sets to meet any requirements, using preferably the cases in the preceding list.

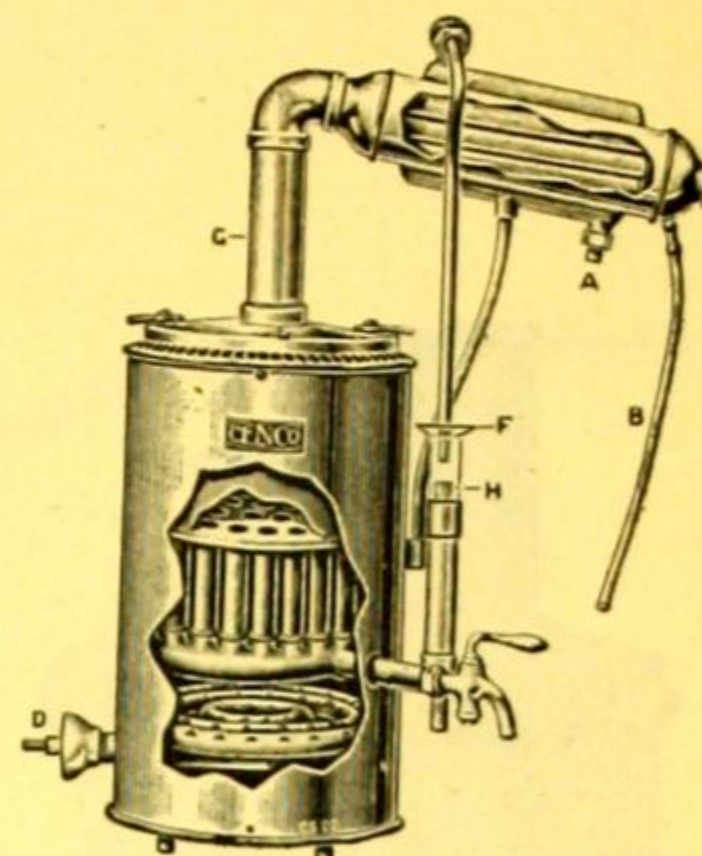
4084. **DISSECTING SET**, consisting of No. 4072 single-fold Leatherette Case, with the following Grade B and C instruments: No. 3898 Forceps, No. 3932 Needle, No. 3934 Needle, No. 3980B Scalpel, No. 4002 Scissors and No. F661 Rule..... 1.45
10% discount in lots of 12, 20% discount in lots of 144.
4086. **DISSECTING SET**, consisting of No. 4072 single-fold Leatherette Case, with the following Grade B and C instruments: No. 3898 Forceps, No. 3948 Needle Holder, No. 3950 Needle Holder, No. 3980B Scalpel, No. 4002 Scissors, and No. F661 Rule..... 1.60
10% discount in lots of 12, 20% discount in lots of 144.
4090. **DISSECTING SET**, consisting of No. 4072 single-fold Leatherette Case, with the following Grade B instruments: No. 3904 Forceps, No. 3906 Forceps, No. 3948 Needle Holder, No. 3950 Needle Holder, No. 3984C Scalpel, No. 4004 Scissors, and No. F661 Rule..... 3.15
10% discount in lots of 12.
4096. **DISSECTING SET**, consisting of No. 4076 two-fold Morocco Case, with the following Grade A instruments: No. 3904 Forceps, No. 3906 Forceps, No. 3924 Cartilage Knife, No. 3948 Needle, No. 3950 Needle, No. 4056 Seeker and Tenaculum, No. 3988C Scalpel, No. 3988A Scalpel, No. 4010 Scissors, and No. F661 Rule..... 7.35
10% discount in lots of 12.
4098. **DISSECTING SET**, consisting of No. 4078 three-fold Morocco Case, with the following instruments: No. 3908 Forceps, No. 3912 Forceps, No. 3914 Forceps, No. 3990A Scalpel, No. 3990C Scalpel, No. 3990D Scalpel, No. 4004 Scissors, No. 4006 Scissors, No. 4012A Scissors, No. 3924 Cartilage Knife, No. 4064 Tenaculum, No. 4056 Seeker, No. 3920 Triple Chain and Hooks, No. 3880 Blowpipe, 3 No. 3890 Artery Forceps, and No. F661 Rule..... 15.00
10% discount in lots of 12.
4100. **DISSECTING SET, Anatomical**, consisting of No. 4076 two-fold Morocco Case and the following Grade A instruments: No. 3882 Blowpipe, No. 3914 Forceps, No. 3890 Artery Forceps, No. 3924 Cartilage Knife, No. 4054 Probe, No. 4056 Seeker and Tenaculum, No. 3988A Scalpel, No. 3988C Scalpel, No. 3996B Scalpel, No. 4012D Scissors, No. 3920 Triple Chain and Hooks, and No. F661 Rule..... 9.75
10% discount in lots of 12.



No. 4120.



No. 4124A.



No. 4125A.

DISTILLING APPARATUS FOR WATER

Note:—The U. S. Internal Revenue Office requires that every still purchased for any purpose whatsoever be registered by both seller and purchaser. To assist our customers in satisfying this requirement, we supply to every purchaser of a water still the proper forms to be filled out and returned to us. The details of registration are taken care of by us, and the still is shipped as soon as the regulations have been complied with.

4120. DISTILLING APPARATUS, Acme Automatic Water Still. Made to hang on wall and can be placed wherever gas and water connections may most conveniently be made with pipes or rubber tubing. Occupies space 12x4 inches on the wall, projecting only 14 inches in its widest part. Fitted with removable cover to permit inspection if desired. Arranged to secure maximum amount of water for the minimum consumption of gas. Made of copper and brass, tin lined and nickel-plated. Capacity, one gallon per hour and one-half. With gas burner. \$35.00

DISTILLING APPARATUS, Barnstead Automatic Water Still, the standard outfit for producing chemically pure distilled water for laboratory uses. The internal construction is shown in the illustrations above. The raw water enters at A and flows around the steam pipe in the condenser, cooling and condensing the steam and at the same time being heated by the latter to a sufficiently high temperature to drive off the dissolved ammonia and other gases, which escape as the water flows into the open pipe at F. This pipe connects with the boiler into which the water enters and is quickly converted into steam by the gas or electric burner. The steam thus formed passes up through the throat G and into the condenser. Pure distilled water free from dissolved gases, is discharged at B. The rate of flow of cooling water should be regulated so that it becomes as hot as possible in the condenser without permitting any large amount of vapor to escape uncondensed at J. The top of the still and attached condenser are easily removed by turning the thumb screws at the top, permitting easy access to the boiler for cleaning.

In the gas-heated type a very effective radial burner of generous size is enclosed in the base beneath the tubular boiler, thus minimizing the loss of heat. As a result, with gas costing \$1.00 per thousand cubic feet, distilled water is produced at the very low rate of 1½¢ per gallon. In the electrically-heated type cylindrical electrical heaters project vertically into the boiler where they are completely immersed, thus yielding practically all of their heat to the water. They will last indefinitely, and, when necessary, renewals may be obtained and are easily inserted by the user.

The stills are built of heavy copper, coated inside with pure block tin. All parts are beautifully finished and nickel-plated in the one and two gallons sizes; the five-gallon size is galvanized. Stills are provided with short legs for standing on the table or on a shelf. Dimensions are given below for the various sizes.

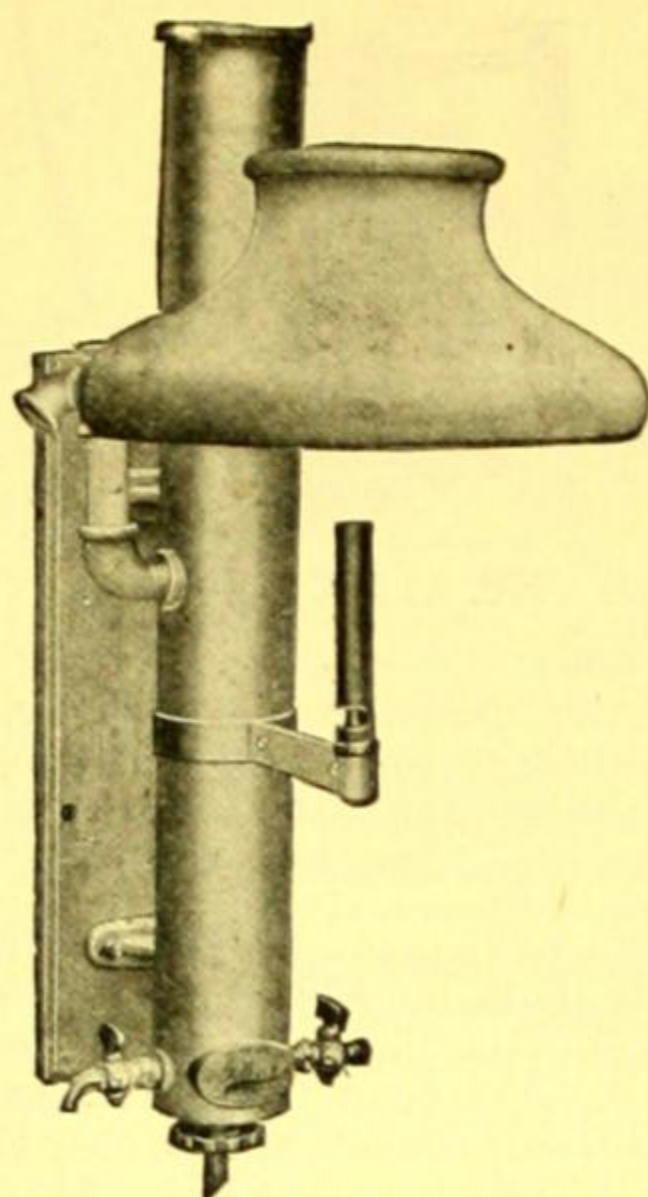
No.	A	C	D
Capacity, gallons per hour.....	1	2	5
Height, inches	24	26	48
Depth, inches	8	9	13
Width over all, inches.....	18	18	24
Energy consumption of electrically heated type, kilowatts....	2.4	6	.....
4124. Each, with electrical heater.....	75.90	121.00	.....
4125. Each, with gas burner.....	60.50	96.80	165.00

Note:—In ordering electrically heated stills, be sure to state voltage. Note also that special wiring is required on account of the large current consumed.

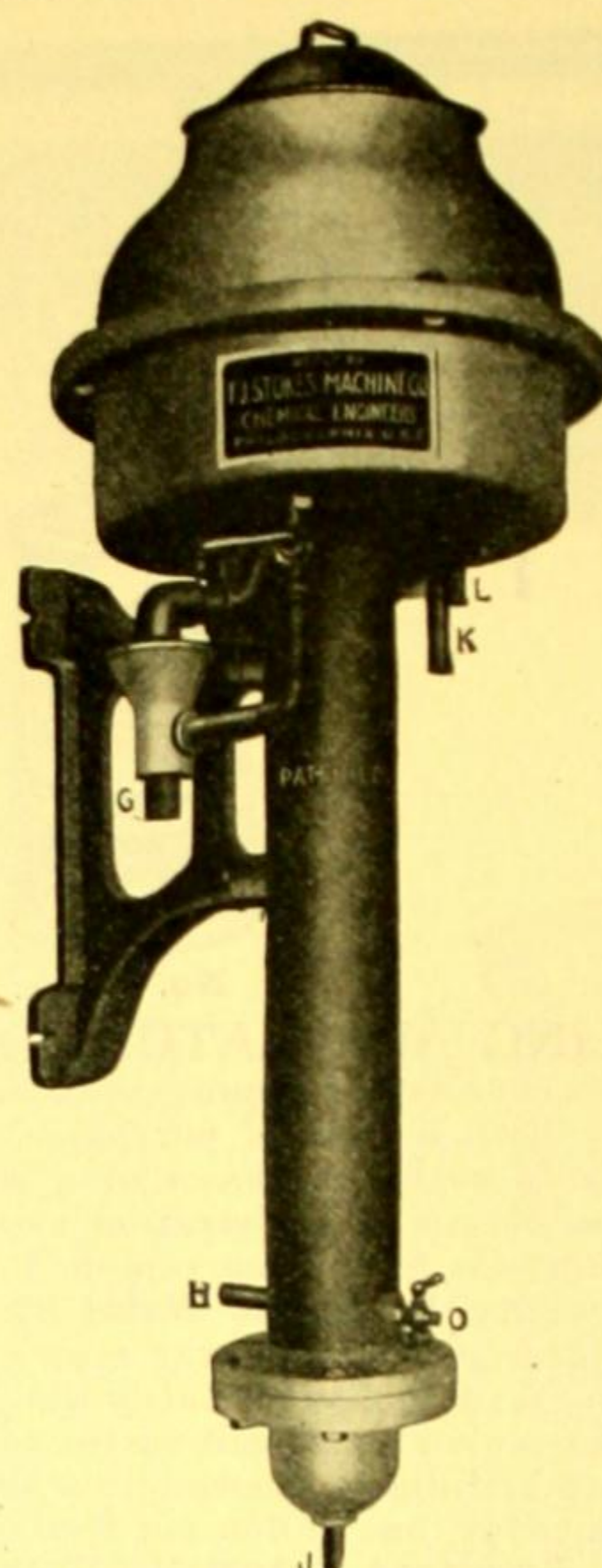
Extra Heating Units, Electric, for No. 4124 Barnstead Stills.

No.	F	G
For still No. 4124.....	A	B
Number of units required for complete still	4	6
4124. Each	6.50	9.00

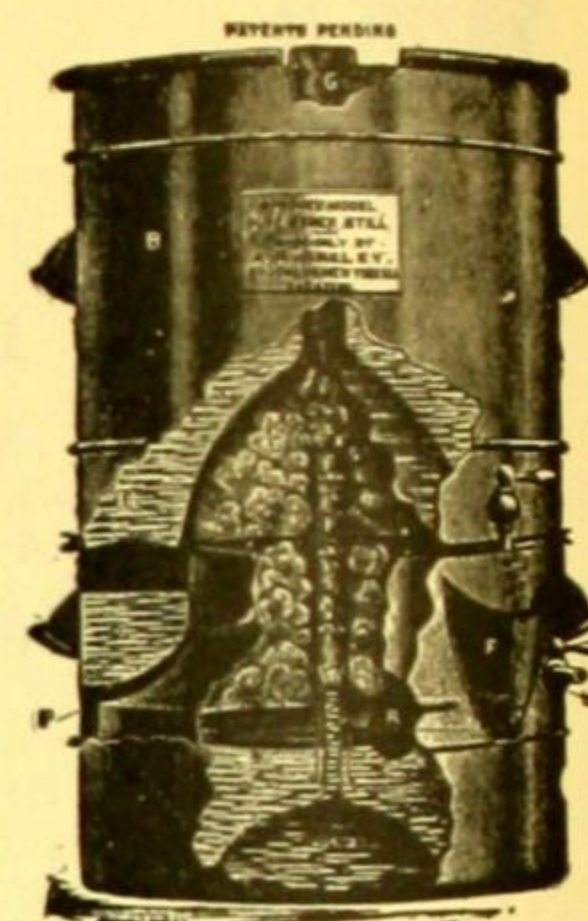
Note:—In ordering, kindly specify voltage.



No. 4136 (shown mounted on wall bracket).



No. 4142.



No. 4138.

4136. **DISTILLING APPARATUS, Peerless Automatic**, with boiler so shaped that the steam is forced through the water to its center where it passes in a compact body into the condensing tube, thus reducing the amount of condensation on the side walls of the still, and producing distilled water at a very low expense for gas. The parts are readily accessible for cleansing. The boiling vessel is of cast iron and not easily burned out or injured by rough handling. The condensing tube is of heavy tinned copper, sufficiently large to insure perfect condensation with a very small stream of water. Finished in aluminum bronze and lacquered brass. With gas burner. Without wall bracket.

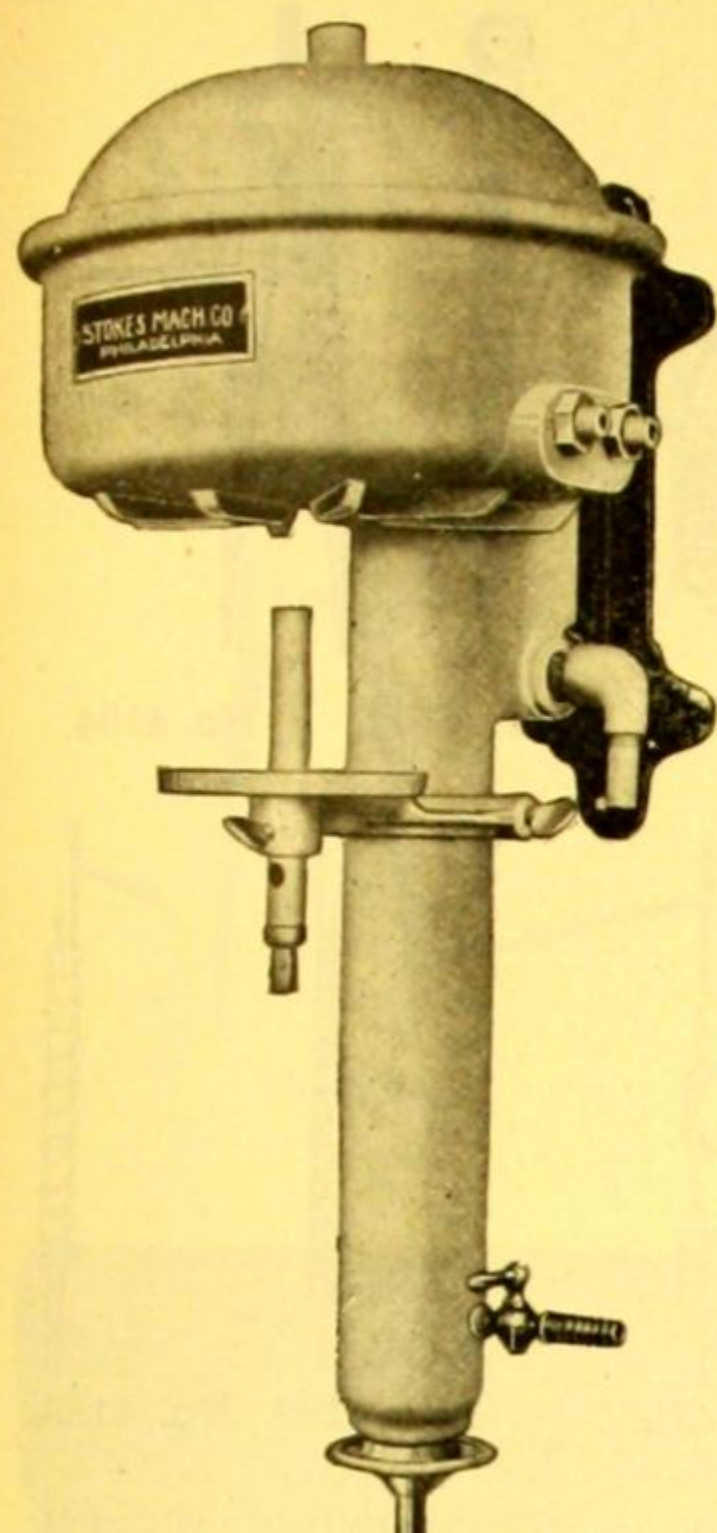
No.	A	B
Capacity, gallons	1	3
Dimensions, inches	24x18x12	26x26x16
Shipping weight, pounds	40	60
Each	\$25.00	50.00

2222. **Burner, Kerosene**, for use with No. 4136, when gas is not available. 7.00

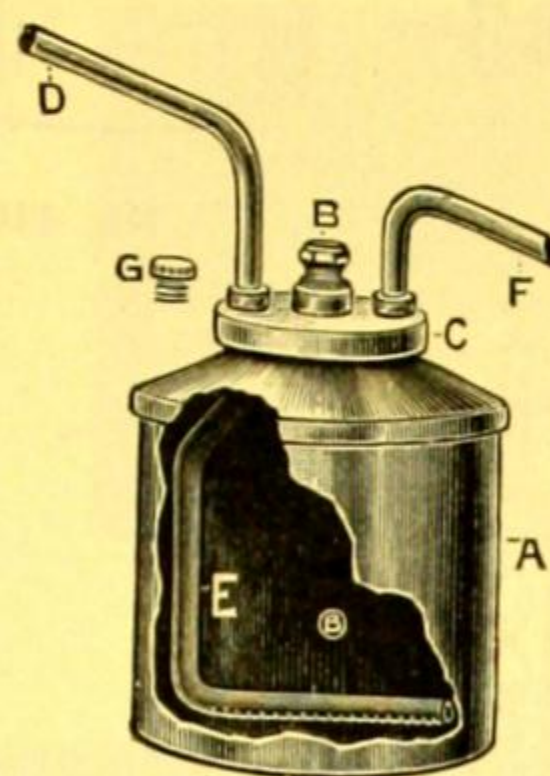
4138. **DISTILLING APPARATUS, Ralston's New Process**. May be used on any stove and does not require water under pressure. The storage of the distilled water within the still prevents the reabsorption of gases. Although not entirely automatic, it is so constructed that it cannot boil dry; it requires little care or attention. It is made of copper and pure tin. Capacity, from 1 to 3 quarts per hour, depending on the amount of heat used. Weight, 7 lbs.; diameter, 9 inches; height, 14 inches. 15.00

4142. **DISTILLING APPARATUS, Stokes Automatic**, steam heated. These stills have two features which render them unusually effective in the production of pure distilled water. First, they utilize the heat generated in the still to preheat the incoming water to the boiling point, thus requiring a very small quantity of live steam to keep them in operation after once started. Second, by preheating the feed water before it enters the distilling chamber ammonia and other gases are liberated and permitted to escape into the atmosphere through an opening in the condenser provided for this purpose, preventing their reabsorption by the distilled water. The distilling chamber and condensing cylinder are of cast iron galvanized to withstand corrosion. The condenser tubes are brass, heavily tinned inside and out. These stills may readily be flushed for cleaning by means of a valve connecting with the drain, or the copper lid may be removed and the inner chamber scrubbed. They are self-contained, requiring only the two connections for steam and water, and are shipped ready to set up. Capacities are based on a steam pressure of at least 20 pounds.

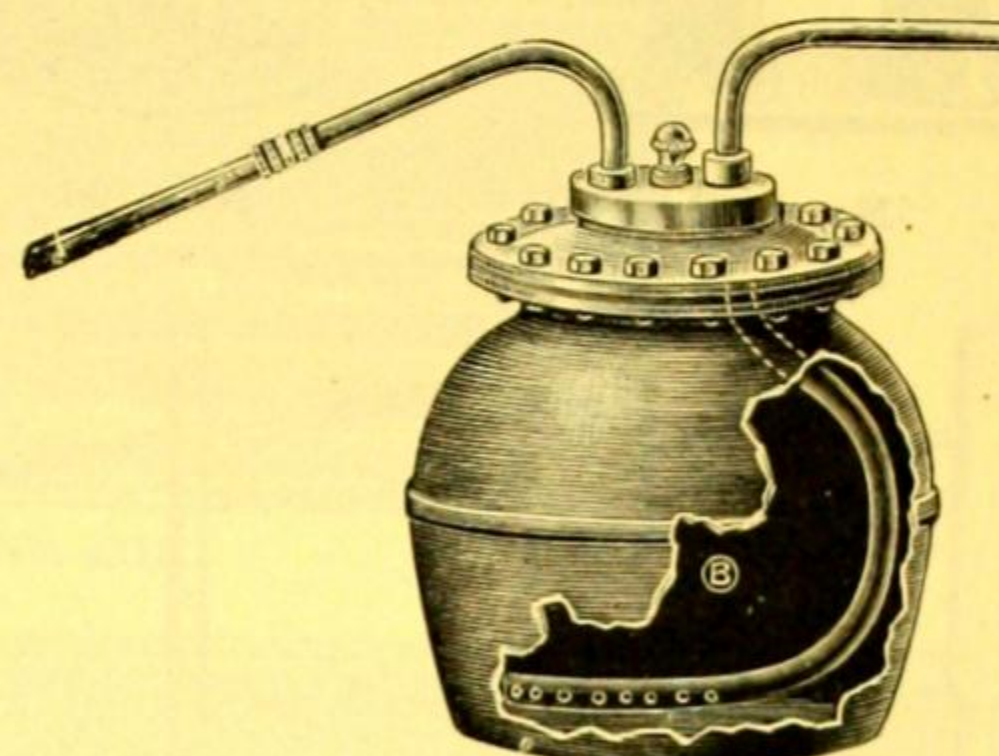
No.	A	B	C	D
Capacity per hour, gallons	$\frac{3}{4}$	$2\frac{3}{4}$	5	10
Height, feet	2	4	$3\frac{1}{2}$	$4\frac{1}{2}$
Weight, pounds	35	110	275	325
Each	30.00	75.00	150.00	200.00



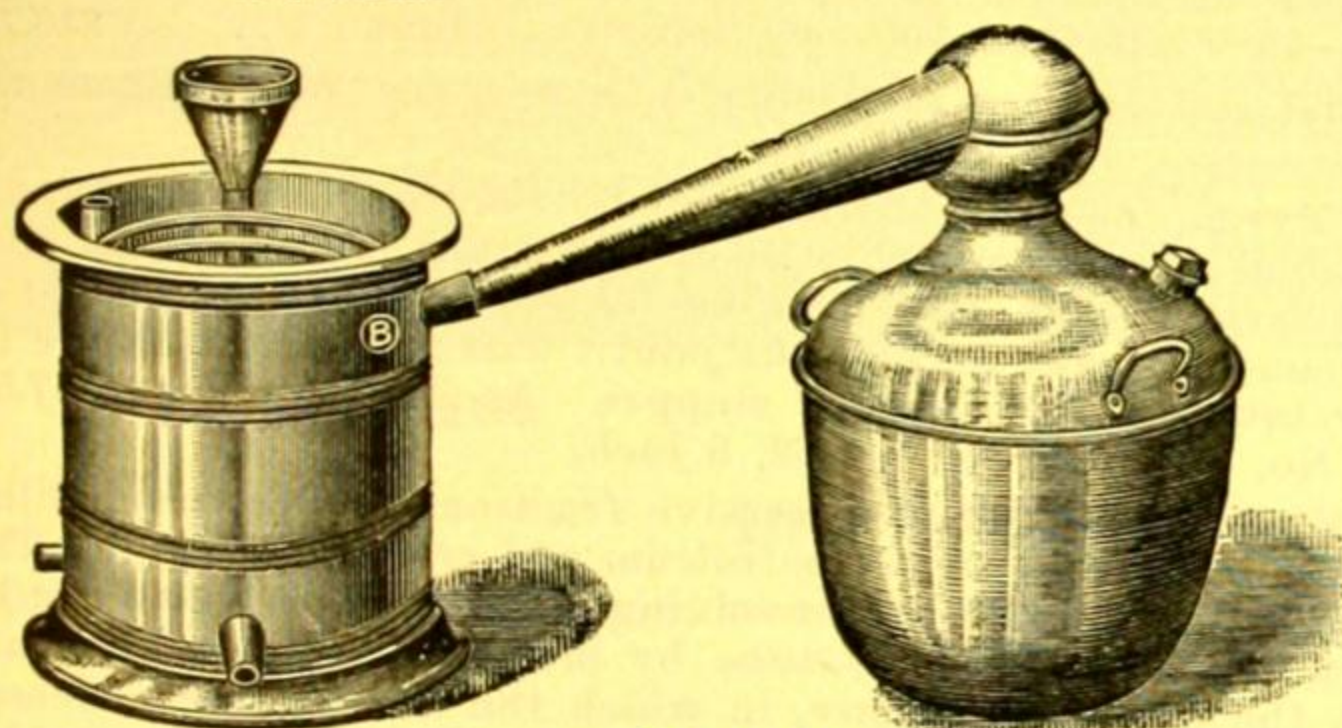
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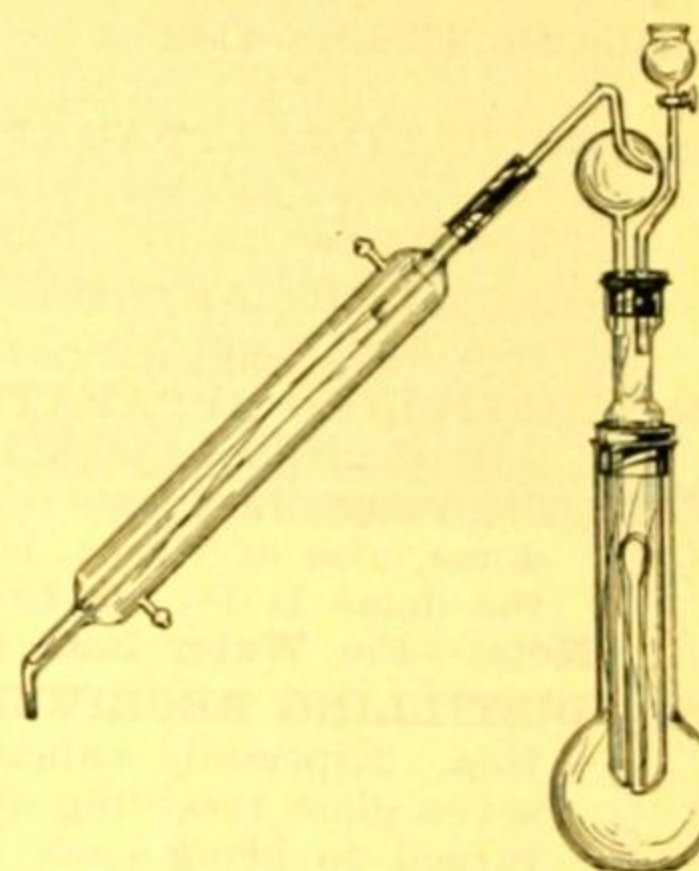
No. 4152.



No. 4153.



No. 4148.



No. 4158.

4144. **DISTILLING APPARATUS**, Stokes Automatic, of same general design as No. 4142, but with double burner for illuminating gas. Capacity, $\frac{3}{4}$ gallon per hour. Height, 24 inches; shipping weight, 50 pounds. With bracket for attachment to wall..... \$27.00

DISTILLING APPARATUS FOR SPECIAL USES

4148. **DISTILLING APPARATUS**, copper retort, tin lined, with removable head, connected with pure block tin condensing worm, enclosed in zinc vessel, with proper inlets and outlets.

No.	A	B	C	D	E
Capacity, gallons	$\frac{1}{2}$	1	2	3	5
Each	15.50	20.00	24.40	32.75	37.75

4149. **RETORTS** only of No. 4148.

No.	A	B	C	D	E
Capacity, gallons	$\frac{1}{2}$	1	2	3	5
Each	9.00	12.50	15.00	19.75	22.50

CONDENSING VESSEL only of No. 4148, see **Condensers** No. 3240.

4152. **DISTILLING APPARATUS**, for the destructive distillation of heavy oils and other liquids or solids requiring a high heat. The distillation may be made by live steam or by direct heat, with or without agitation by hot air blown through as desired. The still is of heavy copper with brass fittings. Capacity, $\frac{1}{2}$ gallon..... 20.00

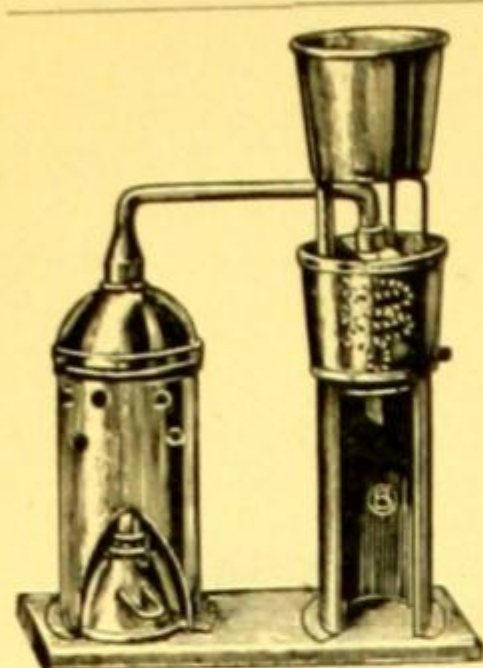
4153. **DISTILLING APPARATUS**, similar to No. 4152, but larger and heavier, with cover bolted on and jointed delivery tube.

No.	A	B
Capacity, gallons	1	2
Each	30.00	46.75

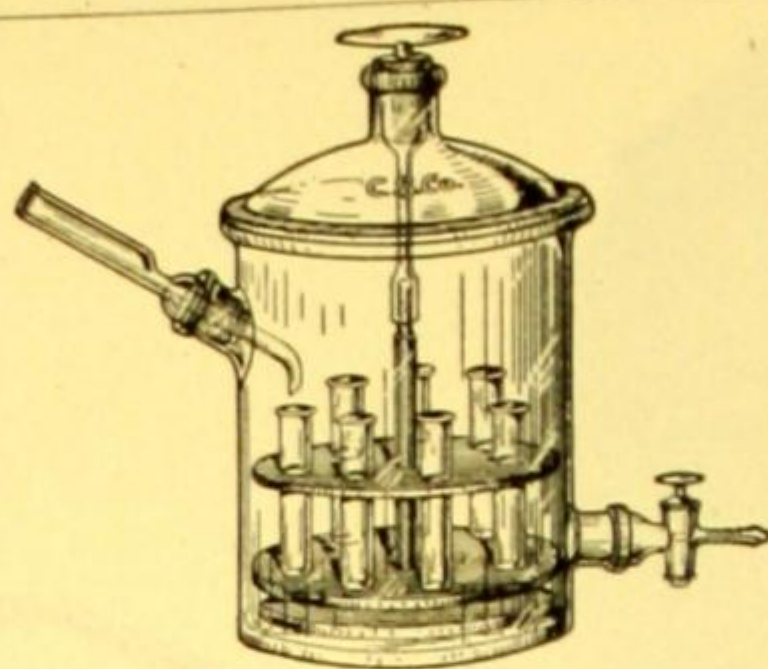
4158. **DISTILLING APPARATUS**, Hortvet's, for determining volatile acids in wines or vinegars, designed by Dr. Julius Hortvet of the Minnesota State Food and Dairy Commission. (See Journal of Industrial and Engineering Chemistry, Vol. I, No. 1, for January, 1909, page 31.) 6.00

DISTILLING

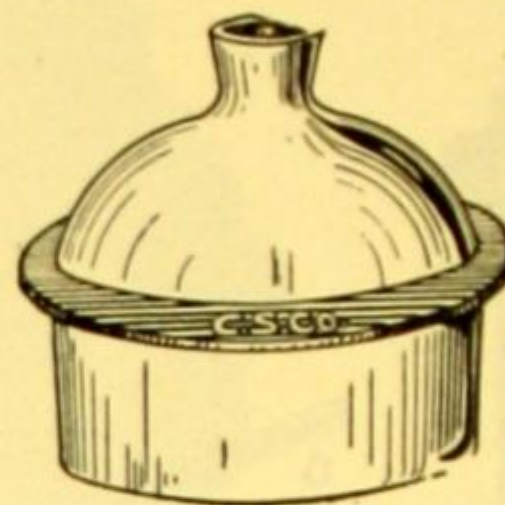
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 4162.



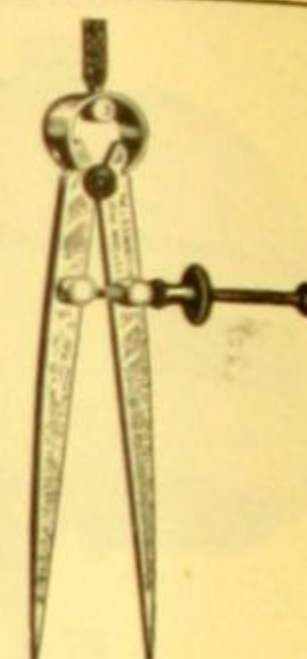
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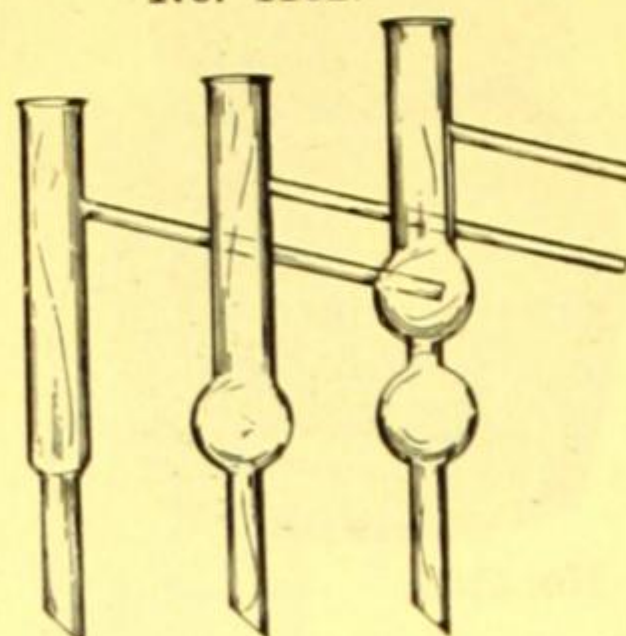
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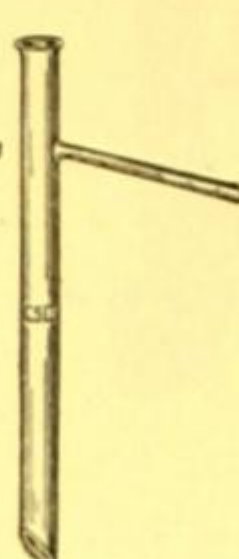
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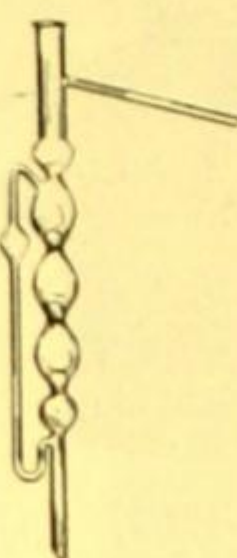
No. 4194.



No. 4168. No. 4170 No. 4172.



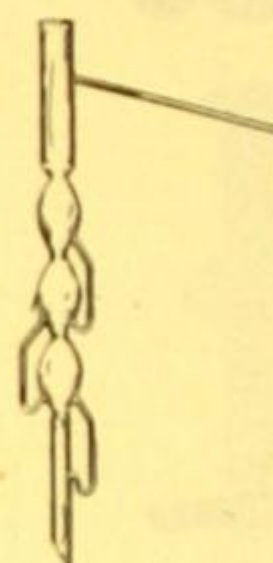
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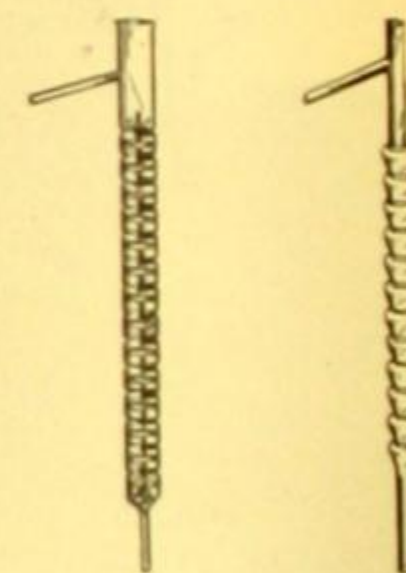
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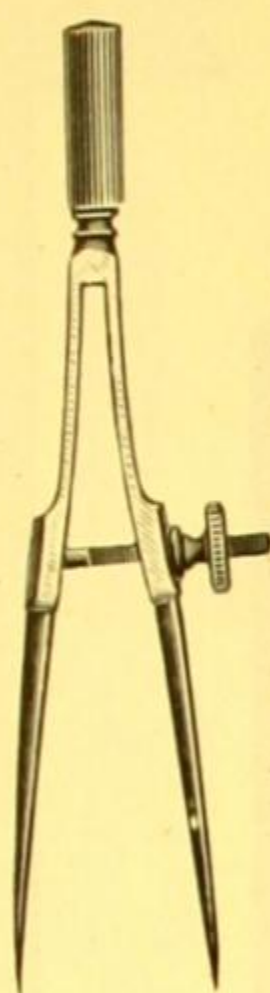


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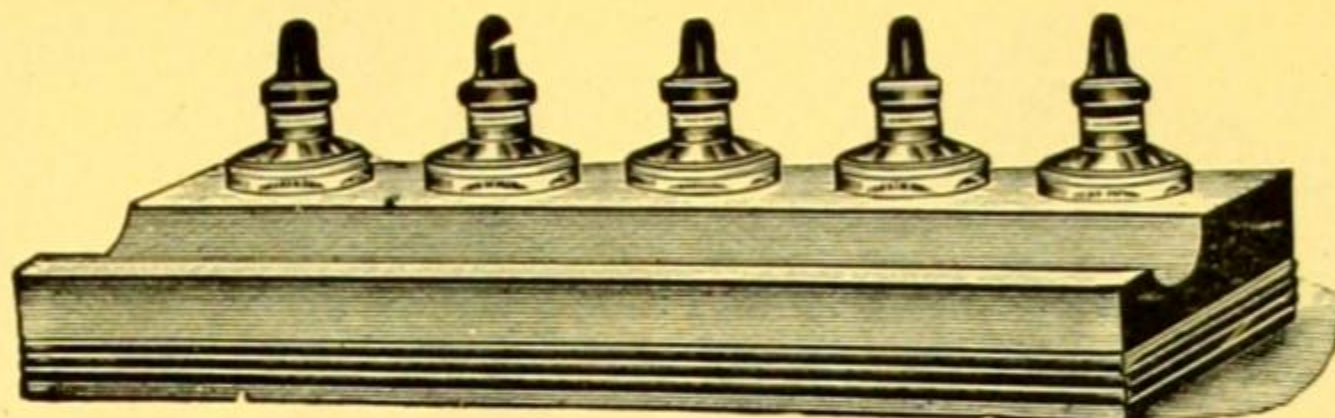


No. 4186. No. 4188.

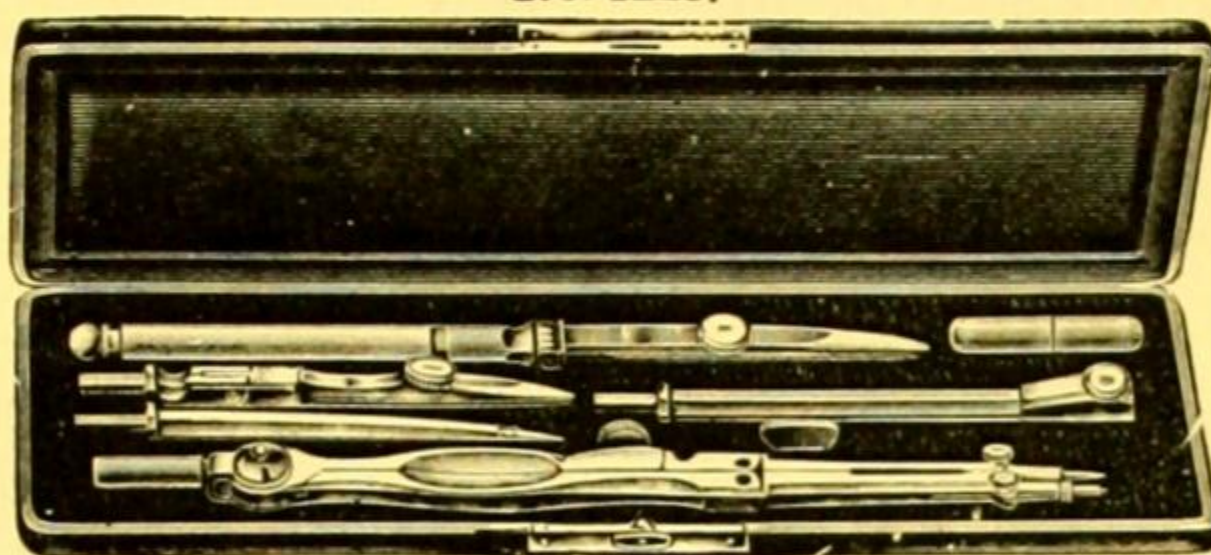
4162. **DISTILLING APPARATUS**, Salleron's, of copper, for use in the determination of the percentage of alcohol in wine, beer, cider, etc. Capacity, $\frac{1}{3}$ pint. Complete with alcohol lamp, hydrometer reading from 0 to 35 degrees Tralle and 100 cc graduated cylinder..... \$16.75
- DISTILLING APPARATUS** for the determination of ammonia in water, see **Water Examination Apparatus**.
4164. **DISTILLING APPARATUS**, Vacuum, Pyrex, for use in distilling under reduced pressure. Especially valuable in organic separations and concentrations. Consists of a flat bottom Pyrex dish $6\frac{1}{4}$ inches in diameter inside, and 4 inches deep, with a wide flange, to which a tabulated dome, also of Pyrex, is carefully ground to make an airtight joint. The ground tubulature in the dome is $1\frac{3}{16}$ inches in diameter taking a No. 6 rubber stopper. As illustrated.... 7.50
- Note**:—For **Water Bath** for use with No. 4164, see No. 14262, 8 inch.
4166. **DISTILLING RECEIVER**, Bruhl, for use in collecting successive fractions in vacuum distillation. Especially valuable in organic laboratories and in petroleum and creosote oil work. The seven glass receiving cylinders, 30x120 mm, are held in a revolving metal support which can be turned to bring each vessel in turn under the delivery tube by means of a ground-in glass tube. A delivery tube is ground in the upper tubulature, in which the end of the condenser may be fastened by means of a rubber stopper. A stop-cock in the lower tubulature provides connection to the vacuum pump. Diameter of glass jar, 150 mm; height over all, 270 mm. Complete as illustrated with 14 receiving cylinders 15.00
4168. **DISTILLING TUBE**, for fractional distillation, plain form; length, 9 in.; diameter, $\frac{7}{8}$ in. .35
10% discount in lots of 12.
4170. **DISTILLING TUBE**, with one bulb; length, 8 inches; diameter, $\frac{7}{8}$ inch..... .45
10% discount in lots of 12.
4172. **DISTILLING TUBE**, with two bulbs; length, $10\frac{1}{2}$ inches; diameter, $\frac{7}{8}$ inch..... .50
10% discount in lots of 12.
4173. **DISTILLING TUBE**, Pyrex, especially valuable because of its heat resisting quality. Length, 12 inches; diameter outside, about 1 inch..... 1.00
4174. **DISTILLING TUBE**, Glinky's, with glass valves. Length over all, 15 inches..... 2.00
4176. **DISTILLING TUBE**, Hempel's, filled with glass beads. Length over all, 16 inches..... 2.50
4180. **DISTILLING TUBES**, LeBel-Henninger's.
- | No. | B | D |
|----------------------|------|------|
| Number of bulbs..... | 3 | 6 |
| Each | 1.80 | 3.50 |
4186. **DISTILLING TUBE**, Young's Form, improved, with 20 disks and 21 constrictions. Length over all, 18 inches..... 4.00
4188. **DISTILLING TUBES**, with pear-shaped bulbs.
- | No. | A | B |
|------------------------------|------|------|
| Number of bulbs..... | 4 | 12 |
| Length over all, inches..... | 10 | 20 |
| Each | 2.00 | 4.50 |
- DISTILLING TUBE RECEIVER** for water in petroleum, see **Oil Testing Apparatus**.
4192. **DIVIDER**, Plain, of brass. Length, $4\frac{1}{2}$ inches45
4194. **DIVIDER**, Spring. The popular Yankee polished steel spring divider, 5 inches long..... 1.20



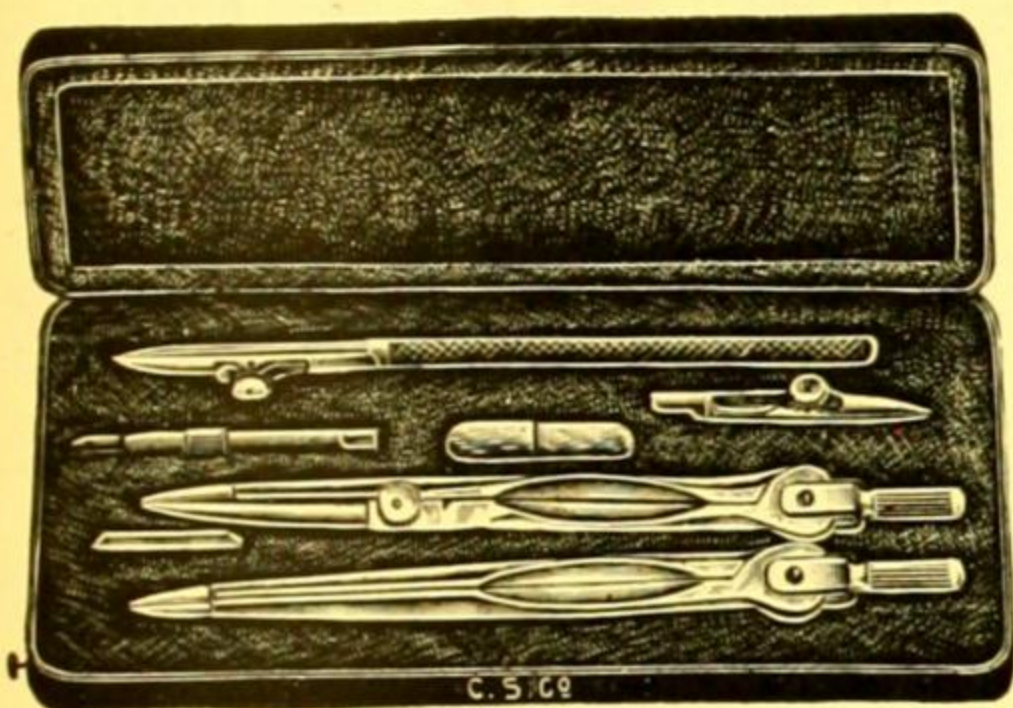
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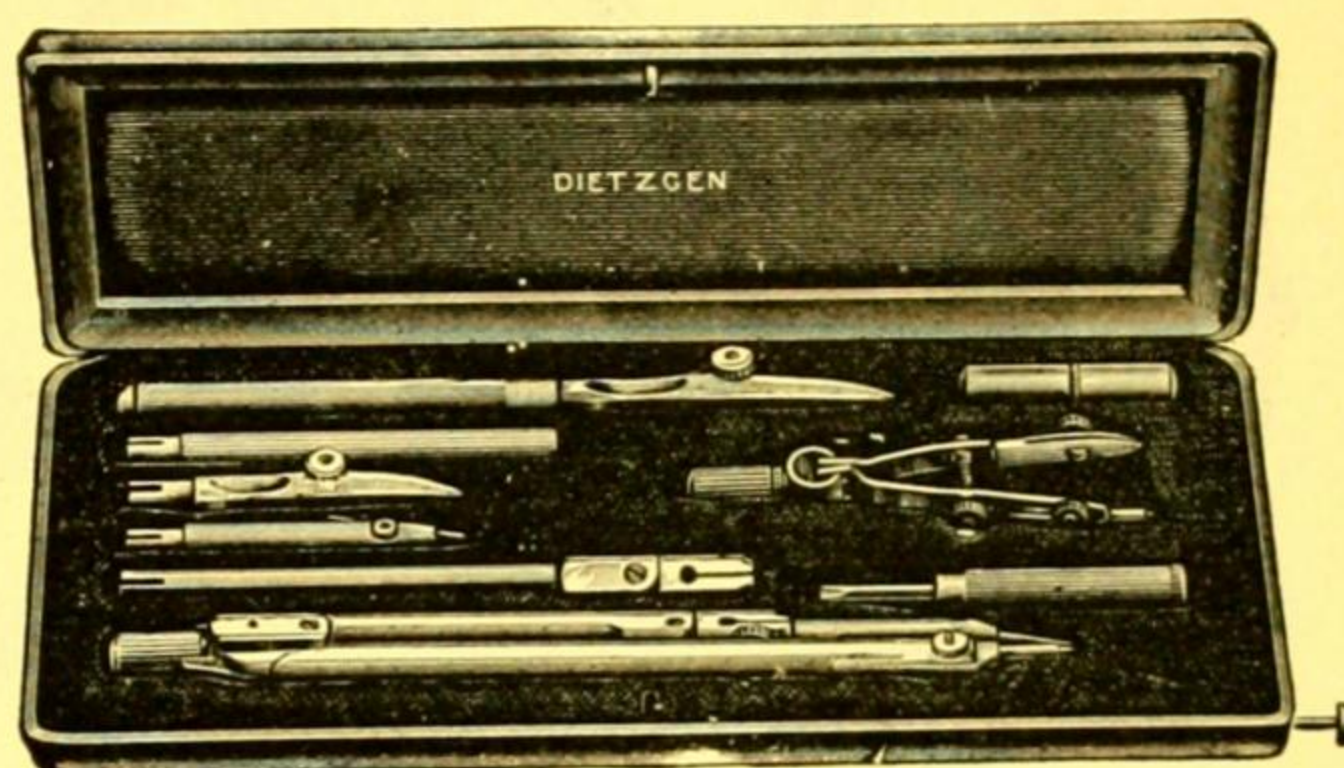
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No. 4218.



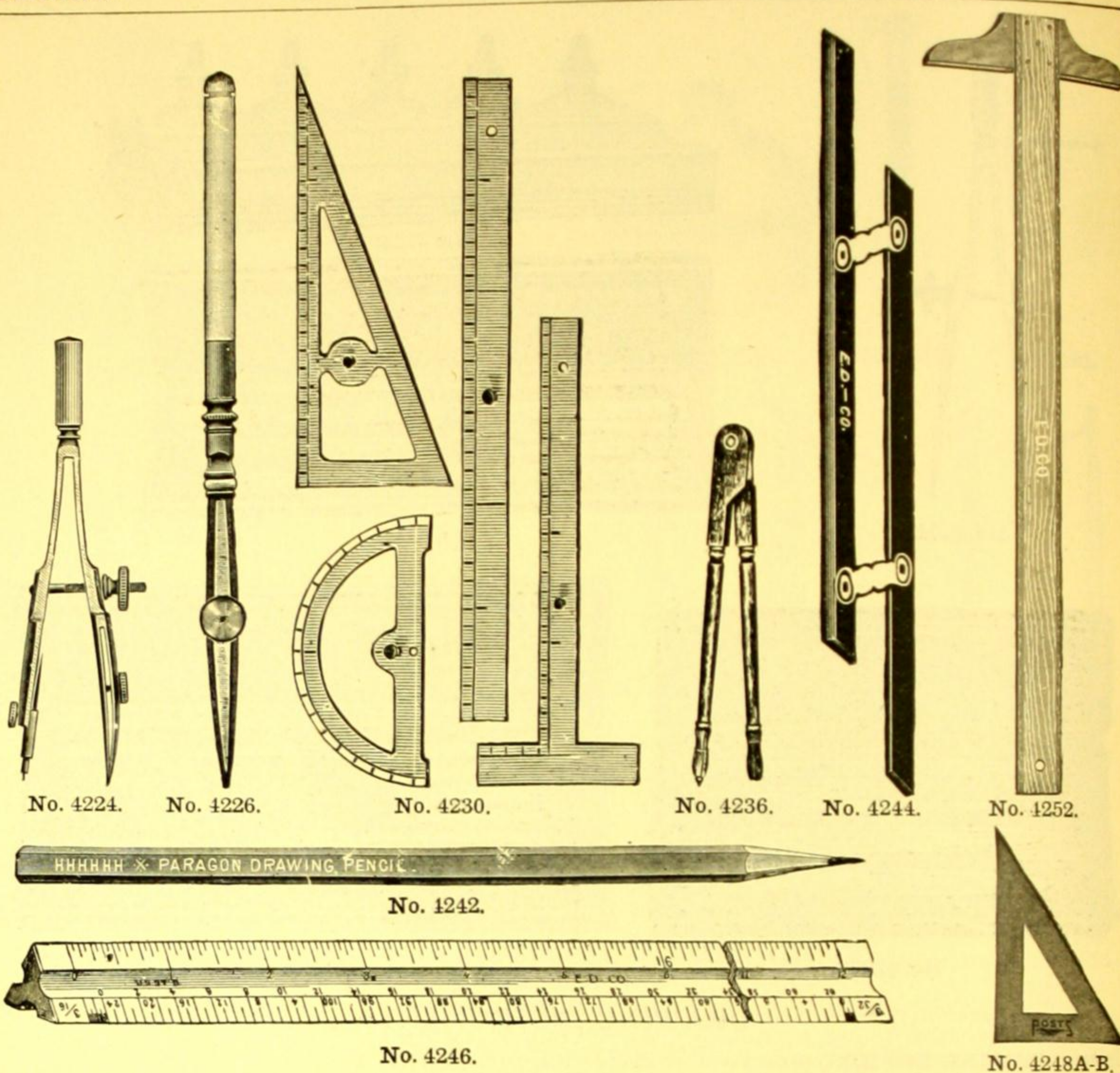
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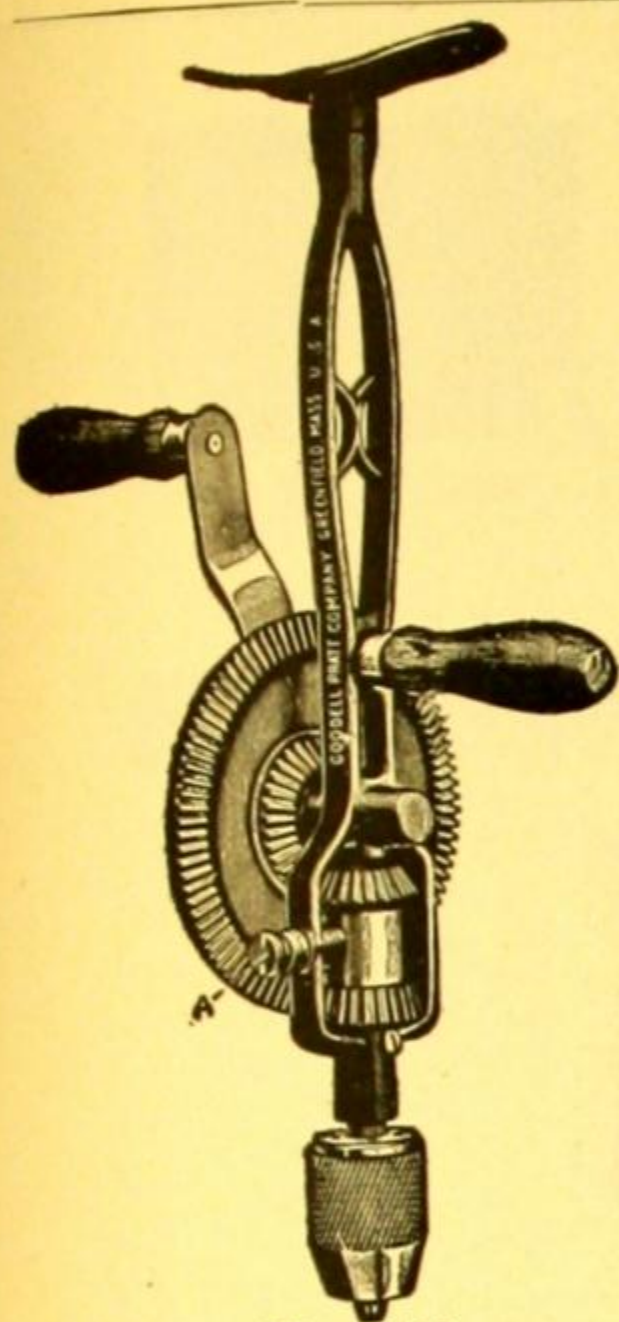
No. 4222.

DRAWING INSTRUMENTS

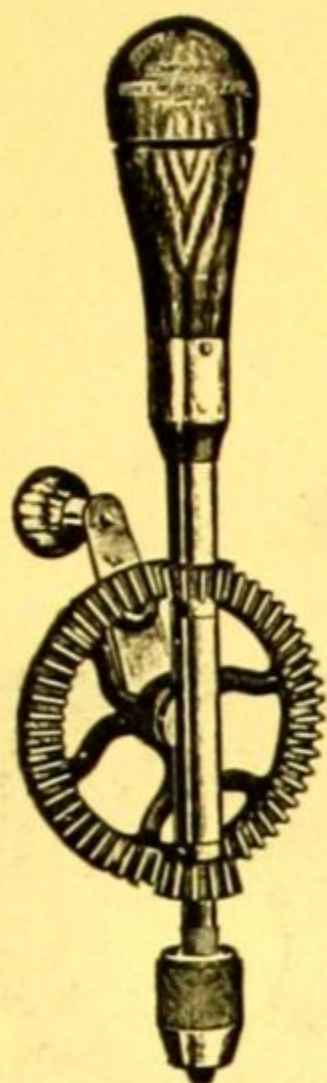
4200. **DRAWING BOARDS**, pine wood, with side ledges clamped.
- | No. | A | B |
|--------------|--------|-----------|
| Size, inches | 16x22 | 20x24 1/2 |
| Each | \$2.00 | 2.50 |
4204. **DRAWING DIVIDER**, steel spring bow divider. Metal handle, steel points; length, 3 1/4 inches. 1.10
10% discount in lots of 12.
4214. **DRAWING INKS** in the following colors: blue, brick red, carmine, green, yellow and waterproof black. Per 3/4 ounce bottle .30
In ordering please state the color desired.
4215. **DRAWING INKS** in nicely finished hardwood tray. Choice of five different colors, selected from list under No. 4214. 2.20
In ordering please state the colors desired.
4218. **DRAWING INSTRUMENTS** for elementary work, of brass, in cloth covered case lined with velvet. Contains ruling pen, 5-inch; compass, 4 1/2-inch, with fixed needle point, pen and pencil points and lengthening bar; and plain dividers, 3 3/4-inch. 2.85
10% discount in lots of 12.
4220. **DRAWING INSTRUMENTS**, of German silver with steel points, in cloth covered case lined with velvet. Contains ruling pen, 5 1/2-inch; compasses, 6-inch, with fixed needle point, pen and pencil points and lengthening bar; dividers, 4 1/2-inch; bow pen, 3-inch; and box of leads. 3.80
10% discount in lots of 12.
4222. **DRAWING INSTRUMENTS**, of German silver, American made, of excellent quality, design and finish, in cloth covered case lined with velvet. This is a high grade set; greatly superior to the cheaply made imported sets. All points and blades are ground and polished to the exact degree of fineness required to secure the best results. Complete with 5 1/2-inch ruling pen with aluminum handle; 6 1/2-inch compass and divider of improved design, with 4-inch lengthening bar, pencil and pen points; handle for use with pencil and pen points for ruling work; 3 1/2-inch bow pen; box of leads; hollow handled screw driver and extra points for divider. 5.10



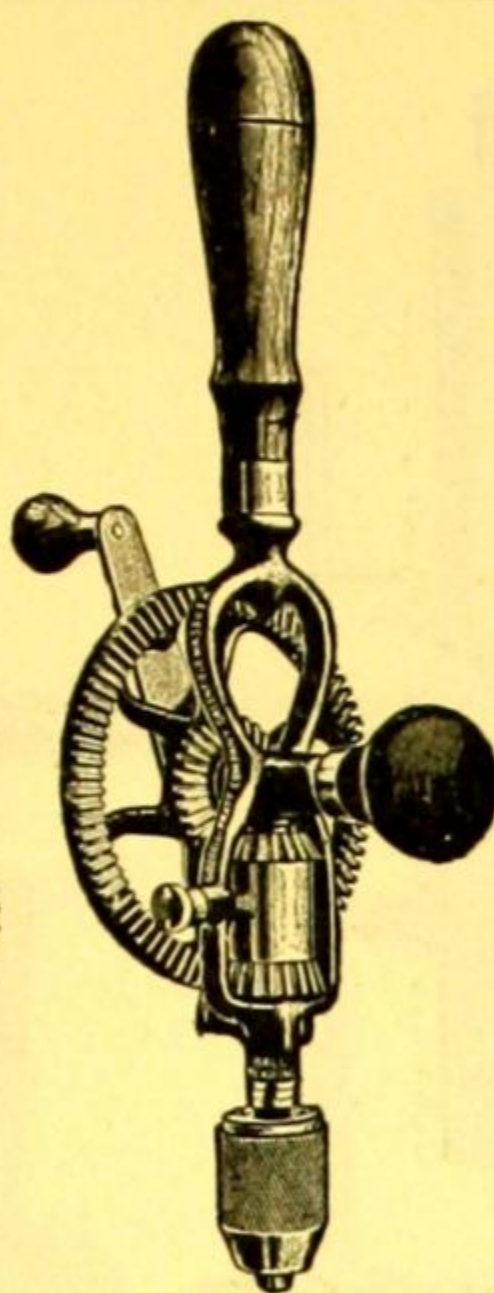
4224. **DRAWING PEN**, Bow, steel spring, with steel points and metal handle..... \$1.35
4226. **DRAWING PEN**, Ruling, spring blade, metal handle85
4230. **BLACKBOARD DRAWING INSTRUMENTS**, a set of four pieces, consisting of a 24-inch T square, a 36-inch straight edge, a 24-inch triangle graduated in inches, and a 15½ inch protractor Per set 5.00
4232. **STRAIGHT EDGE** only of No. 4230..... 1.20
4234. **PROTRACTOR** only of No. 4230..... 2.70
4236. **BLACKBOARD COMPASS**, of wood, 15 inches long, with crayon holder and rubber foot.. .70
4242. **DRAWING PENCILS**, Faber, polished.
- | | | |
|------------|-----|-----|
| No. | 4H | 6H |
| Each | .10 | .08 |
4244. **RULE**, Parallel, ebony. Length, 12 inches..... 1.10
4246. **SCALE**, Triangular, boxwood, one edge graduated for 12 inches in 1/16ths; the other edges have scales of 3/32, 1/8, 5/16, 1/4, 3/8, 1/2, 3/4, 1, 1½ and 3 inches to the foot..... .75
For **STRAIGHT EDGE**, see No. 12974.
4248. **TRIANGLES**, Celluloid.
- | | | | | |
|---------------------------|---------|---------|-----|-----|
| No. | A | B | C | D |
| Angles, degrees | 30 & 60 | 30 & 60 | 45 | 45 |
| Longest side, inches..... | 6 | 8 | 6 | 8 |
| Each | .30 | .50 | .40 | .50 |
4252. **T SQUARES**, pearwood blade and head, fine quality.
- | | | |
|----------------------|-----|-----|
| Length, inches | 24 | 30 |
| Each | .45 | .50 |
4256. **DRAW PLATE**, of hardened steel, for drawing wire to smaller sizes. Numbers are not standard gauge, but approximate those of the Starrett gauge. With holes numbered from 1 to 30.. 3.00
- Note:—10% discount in lots of 12 from list prices of Nos. 4224, 4226, 4236 and 4248.



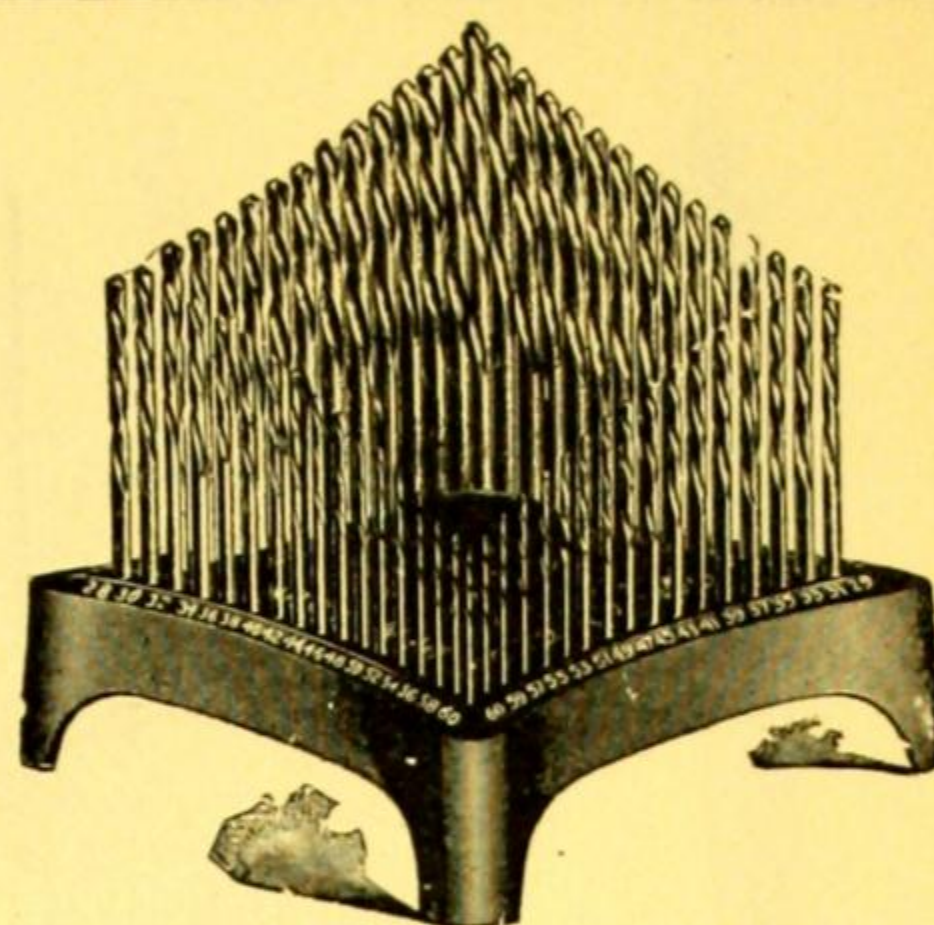
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No. 4260.



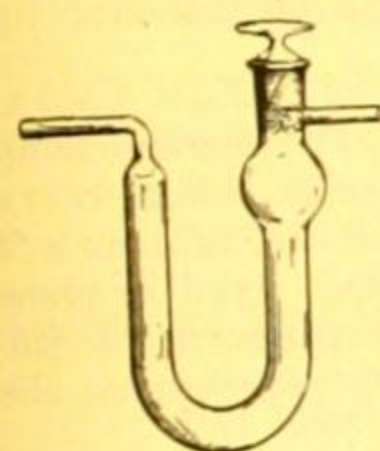
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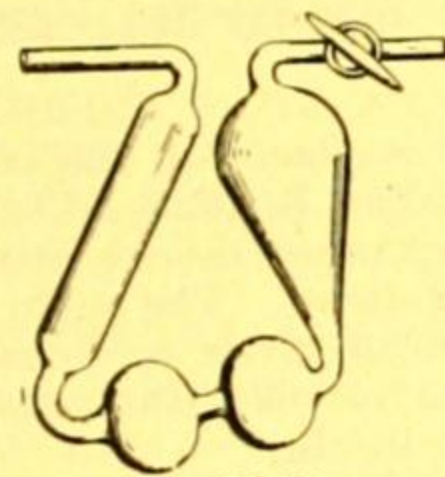
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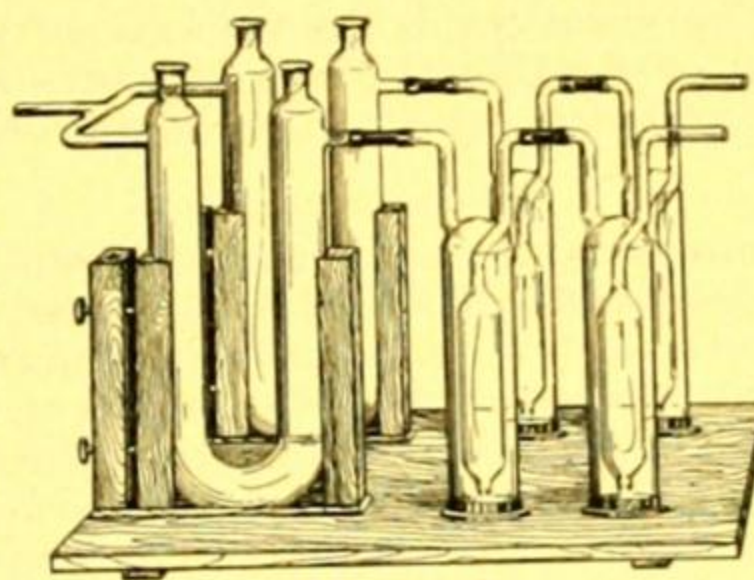
No. 4272.



No. 3143.



No. 3144.

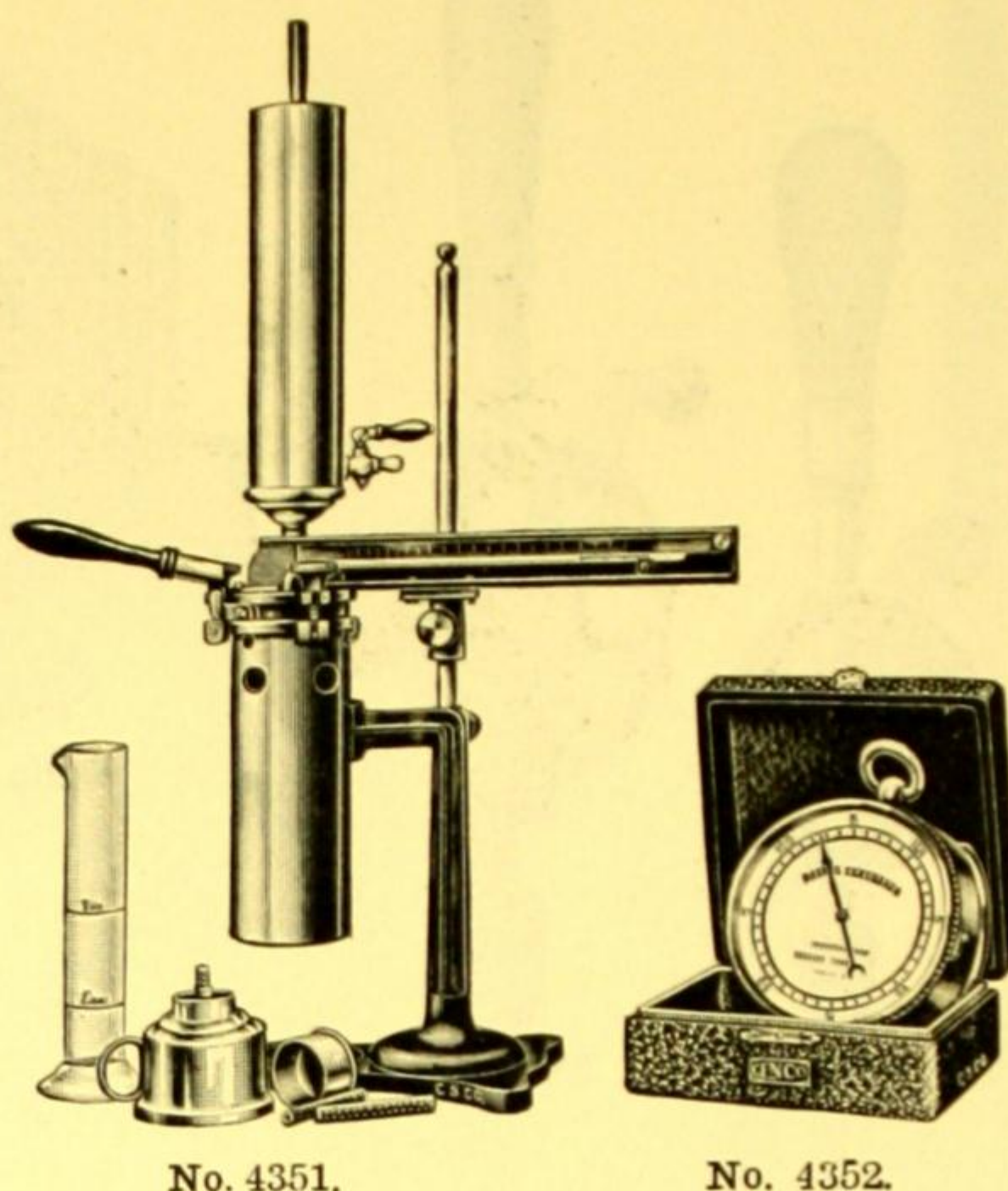


No. 4282.



No. 4266.

4258. **DRILL, Breast**, double gears, capacity of chuck 0 to $\frac{1}{2}$ -inch, two speeds; adjustable breast plate; spindle runs in a hardened steel cone bearing \$5.90
4260. **DRILL, Hand**, single gear, length $10\frac{1}{2}$ inches, with 8 steel drill points from $\frac{1}{16}$ to $\frac{11}{64}$ inch; capacity of chuck 0 to $\frac{5}{32}$ inch; holds either fluted or round shank drills. Frame all steel, polished and nickel-plated 3.50
4261. **EXTRA DRILL POINTS** for No. 4260, plain round shanks. May be used also with Nos. 4258 and 4264 Drills. In sets of eight, $\frac{1}{16}$ to $\frac{11}{64}$ inches Per set .50
4264. **DRILL, Hand**, double gears, two speeds, capacity of chuck 0 to $\frac{3}{8}$ inch; knurled nut; frame of malleable iron, japanned 5.50
4266. **DRILL, Hand, Automatic**, $9\frac{1}{2}$ inches long, nickel-plated. Eight steel fluted shank drills, from $\frac{1}{16}$ to $\frac{11}{64}$ inches, enclosed in the handle in numbered compartments. A very useful tool for boring holes in wood, bone, etc. 2.90
4267. **EXTRA DRILL POINTS**, fluted shank, as supplied with No. 4266. In sets of eight. Per set .80
4272. **DRILLS, Twist**, straight round shank, for wood or metal.
- | Diameter, inches | $\frac{1}{16}$ | $\frac{1}{8}$ | $\frac{3}{16}$ | $\frac{1}{4}$ | $\frac{5}{16}$ | $\frac{3}{8}$ | $\frac{7}{16}$ | $\frac{1}{2}$ |
|------------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|
| Each | .10 | .12 | .15 | .21 | .28 | .40 | .55 | .75 |
4274. **DRILLS, Twist**, straight round shank. Nos. 1 to 60, Stubs' steel wire gage, mounted on neat iron base which can also be used as a **Stubs' Steel and Wire Gage**. Indispensable for the laboratory shop 9.00
4282. **DRYING APPARATUS**, Tauber's, with 2 U tubes and 4 jars with sealed in tubes. Mounted on board as shown 20.00
- DRYING OVENS**, see **Ovens, Drying**. 1.25
3143. **DRYING TUBE**, Vanier's, for zinc, as used in No. 3138 Vanier Combustion Apparatus.. 2.00
3144. **DRYING TUBE**, Vanier's, for sulphuric acid, as used in No. 3138 Vanier Combustion Apparatus 2.00
- For other **DRYING TUBES**, see **Calcium Chloride Jars**.
- For **DRYING JARS**, see **Desiccators**.



No. 4351.

No. 4352.

4351. **EBULLIOSCOPE, Contassot** (Patented), for determining directly without calculation the percentage of alcohol in beer, wine, vinegar and other alcoholic liquors. The method used is that of a comparison between the boiling points of pure water and the liquid under examination. However, instead of reading the temperatures of ebullition from a fixed thermometer scale, a movable scale is provided, which is graduated to read directly in percentage of alcohol by tenths.

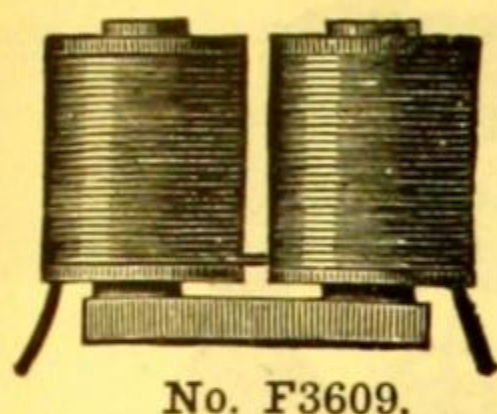
In making a determination, a fixed amount of pure water is placed in the boiler, the alcohol lamp is lighted and placed under it and the condenser is clamped in place. As soon as the mercury column in the thermometer has become stationary the graduated scale is moved to right or left until its zero mark is opposite the end of the mercury column. The scale is then fixed in place by a set-screw, the boiler removed and the water replaced with a measured amount of the liquid under test. When the mercury column has again become stationary, its position on the scale indicates directly the percentage of alcohol in the liquid.

The ebullioscope is accurate and reliable, being used officially in the government laboratories of France and other European countries. Many of them are in successful use in this country. The complete directions, which are furnished with the instrument, make it possible for anyone to become familiar with its use in a short time. They cover practically every application and contain precautions which preclude the possibility of errors due to differences in altitude, changes in atmospheric pressure, etc.

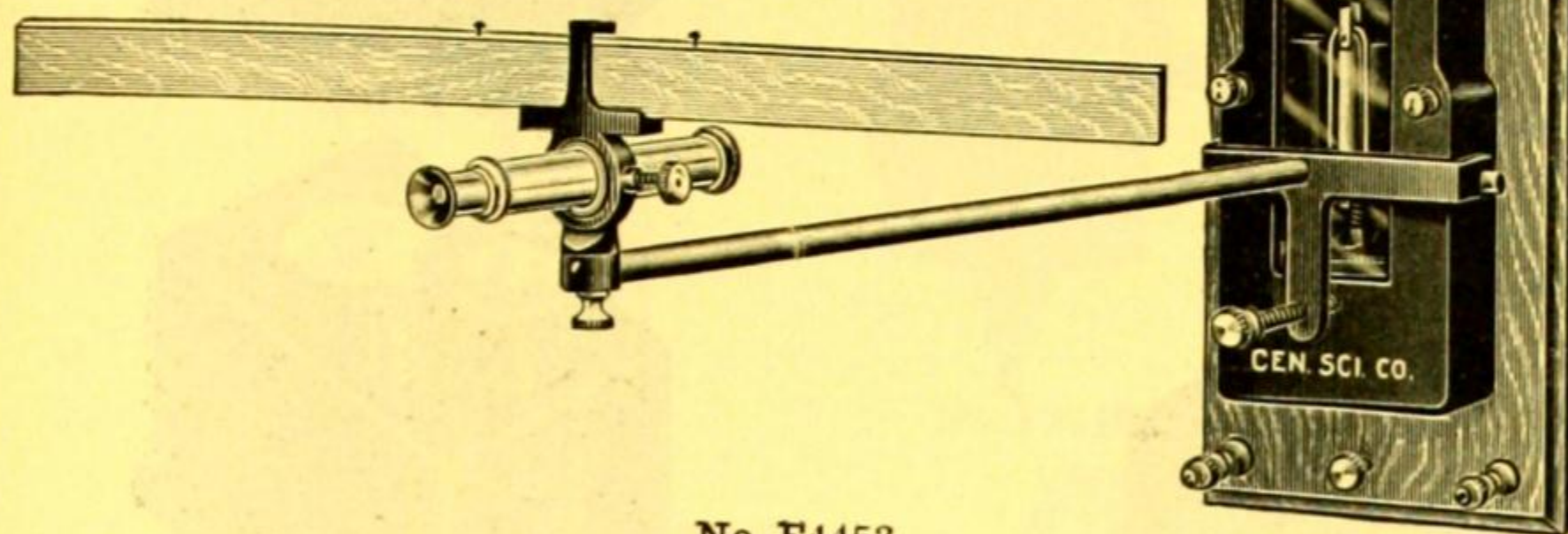
The instrument consists of a tin-lined copper boiler with handle attached, which is inserted in a perforated jacket securely fastened to an iron support stand. To the cover of this boiler is attached the right-angle thermometer of glass, held by a brass arm carrying the movable scale. A reflux condenser, provided with an outlet tube and a stop-cock for drawing or for regulating the flow of cooling water, is also attached to the cover. The brass arm holding the movable scale, the boiler cover and the condenser is mounted to slide on a vertical support rod to which it may be clamped by means of a set screw.

The outfit includes a small brass alcohol lamp with two extra wicks, and a glass cylinder for measuring the water and the samples to be tested. All parts are of highly polished and lacquered brass, except the support stand which is of japanned iron. The instrument is well made by the original French manufacturers and presents a very neat appearance. In wooden case, with complete directions for operation and for the examination of the various types of liquors \$65.00

4352. **Thermoscope** for use with No. 4351, for reducing the time of a determination by obviating the necessity for measuring the boiling point of water in each test. The instrument is a dial thermometer with movable scale, which should be set for the altitude of the observer's locality by making one determination of the boiling point of water with the ebullioscope. When once set, the readings of the thermoscope indicate directly the position to which the movable scale on the ebullioscope should be moved each time before introducing the liquid to be tested. In velvet lined case covered with imitation leather 35.00



No. F3609.



No. F4453.

Removable
Coil System.

ELECTRICAL INSTRUMENTS, ALL KINDS

BATTERIES, Primary and Storage, see general heading Batteries.

BELLS, Electric, see general heading Bells.

CENTRIFUGES, see general heading Centrifuges.

CONDENSERS, Paper and Mica, see Catalog F of Physical Apparatus.

DEMONSTRATION ELECTRICAL APPARATUS, see Catalog F of Physical Apparatus.

ELECTROLYSIS OF WATER APPARATUS, see Lecture Apparatus.

ELECTROLYTIC APPARATUS, see No. 5140.

F3609. **ELECTROMAGNET**, 5 ohm resistance, for instrument making \$1.00

ELECTROSCOPES, see Radioactivity Apparatus.

ELECTROSTATIC APPARATUS, see Catalog F of Physical Apparatus.

FURNACES, see general heading Furnaces.

F4453. **GALVANOMETER, D'Arsonval, Wall Form**. This Galvanometer is a superior instrument, compact in design, and well finished in every detail.

The Magnet is laminated, giving a strong, uniform and permanent field, which is concentrated by a soft iron core. The instrument is mounted on a finely finished hardwood board.

Coil System. As noticed from the illustration, one of the principal features of this Galvanometer is its REMOVABLE COIL SYSTEM. The coil is suspended in a frame and forms with it a UNIT which slides into place by means of guides into a good electrical contact. It is therefore possible, by securing any number of coil systems, to have a universal instrument with only the additional cost of the extra systems. Also, if any adjustments or repairs are to be made on the suspension system, the frame can be removed and laid flat on the table.

Each galvanometer is supplied with a 250 ohm DEAD BEAT Coil, with a plane mirror of $\frac{5}{8}$ -inch diameter. Extra coils are listed below.

The Suspension. The upper suspension is a phosphor-bronze ribbon (see No. F4511). The lower suspension is a copper helix.

The Reading Device consists of a telescope with achromatic objective and a bichrome scale mounted upon an adjustable arm, which may be entirely removed when not in use.

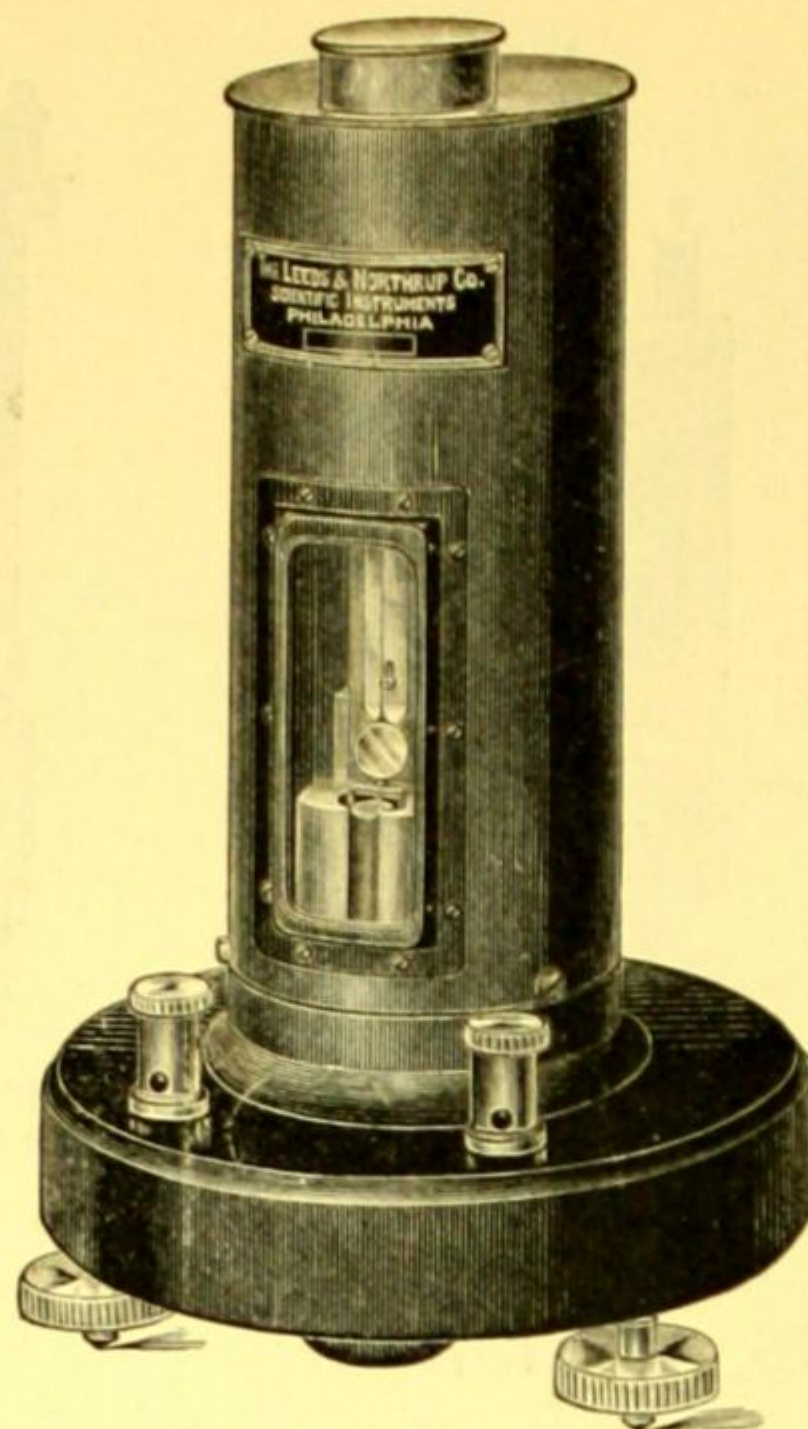
The Housing is of cast aluminum, combining strength with lightness, and is detachable by loosening two thumb screws, giving easy access to the interior. A large window is provided for viewing the moving system.

Mounting and Leveling. The galvanometer is suspended on the wall by means of two suspension loops on the hardwood board which supports the magnet and housing. These loops are provided with leveling screws and, with a third leveling screw in the center of the base board, provide a convenient means of leveling the instrument.

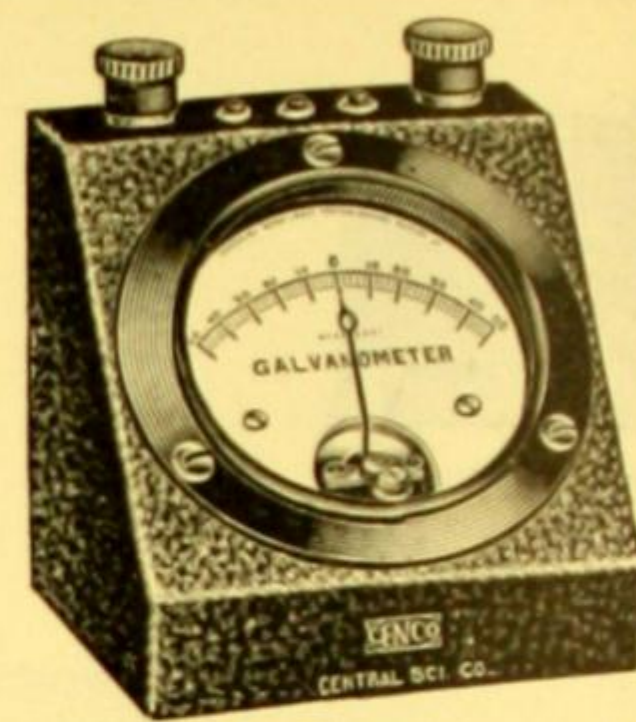
Sensibility. From the mean of a number of readings the sensibility in megohms was found to be as follows:

With dead beat coil of resistance, ohms.....	5	250	500
At working distance.....	3.5	33	48
At one meter distance.....	7.3	68	100

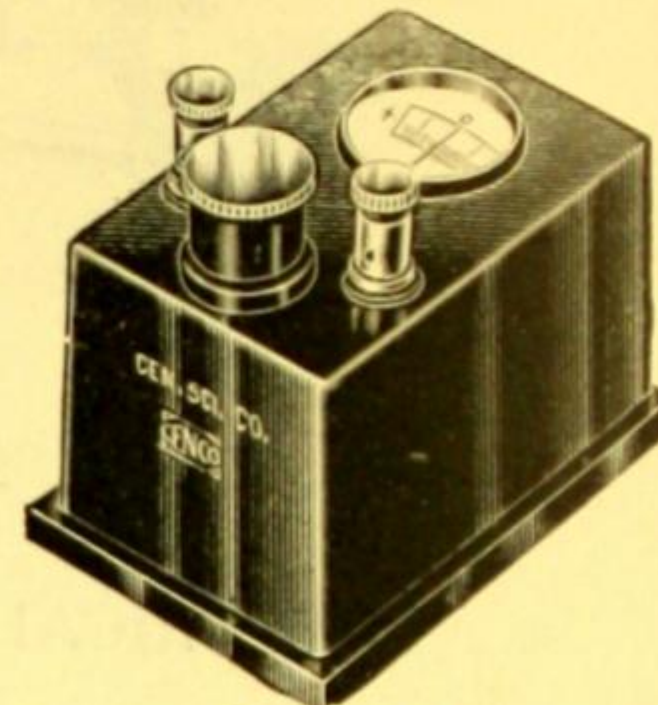
Suitable for use with..... thermo- Wheatstone hydrogen
couple bridge electrode
Complete with 250 ohm Dead Beat coil, reading telescope and scale, and jeweler's screwdriver.
..... 50.00



No. F4458.

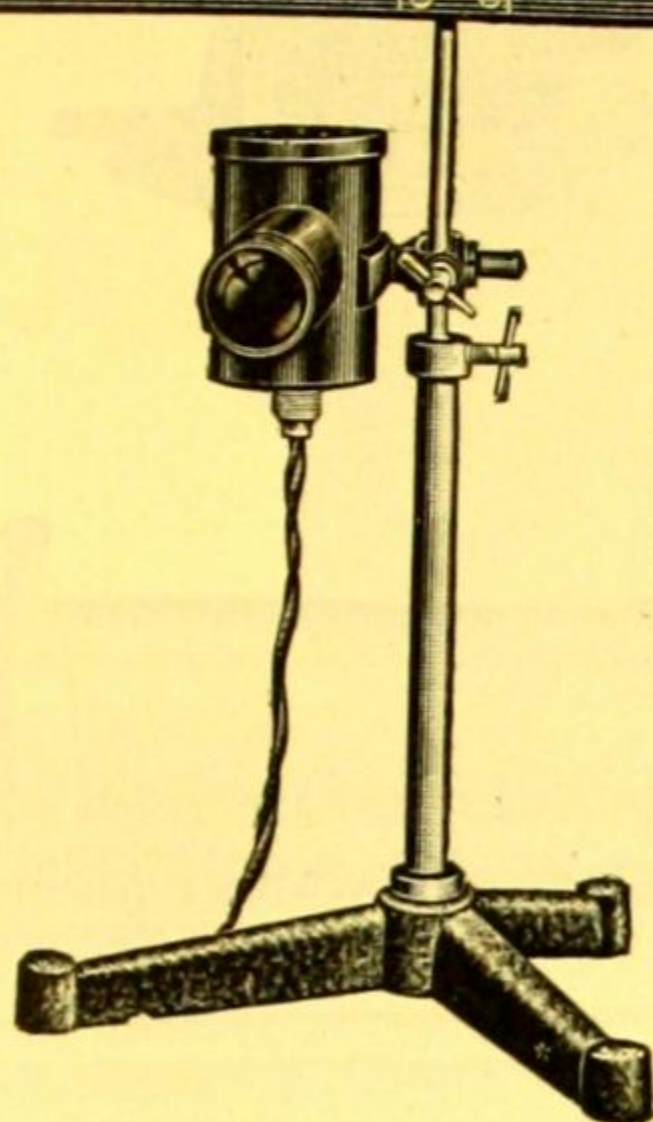
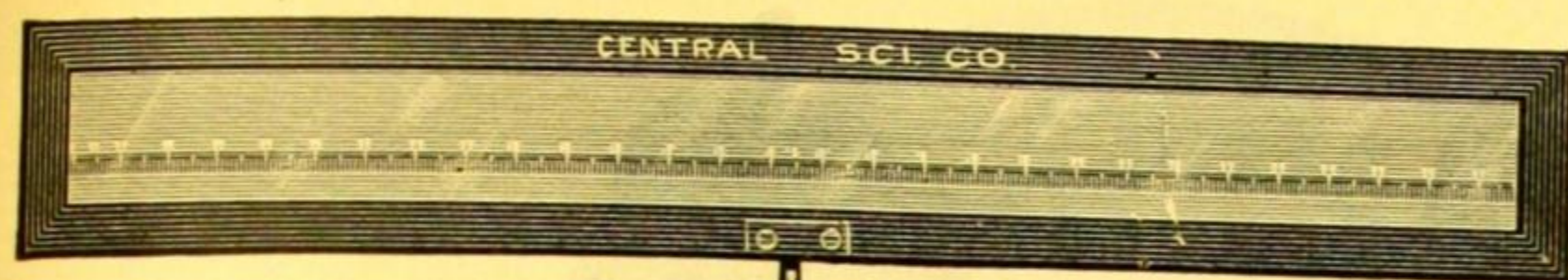


No. F4462.

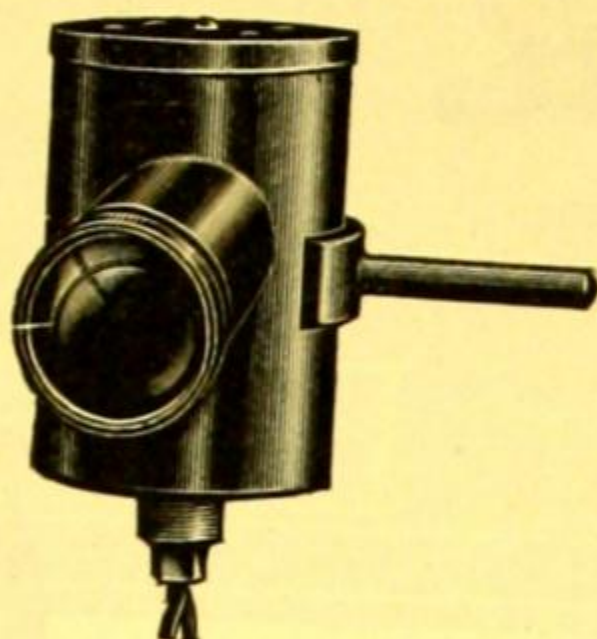


No. F4464.

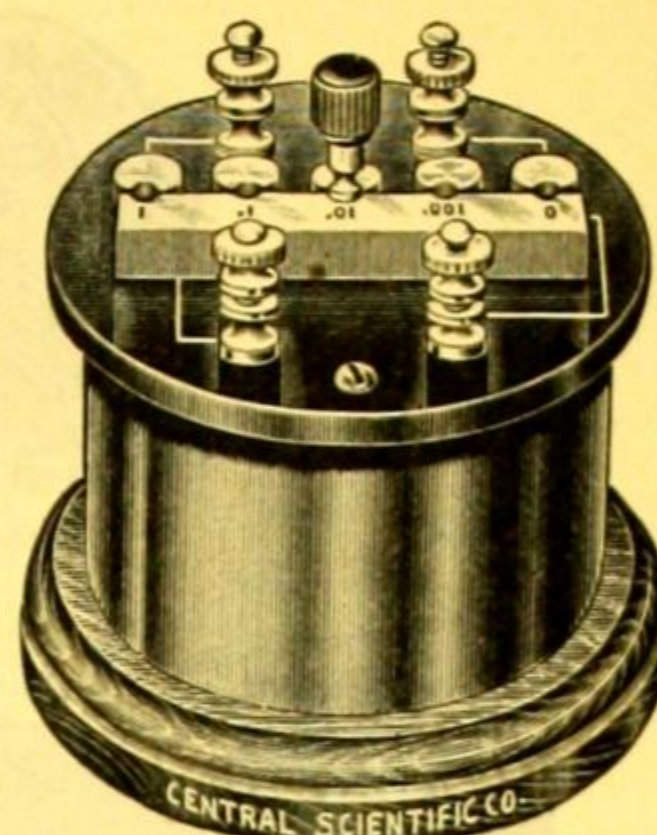
- F4454. **GALVANOMETER, D'Arsonval, Table Form.** Same as No. F4453, but mounted on a heavy tripod for table use. \$55.00
- F4456. **COIL SYSTEMS, Dead Beat, for Nos. 4453-4.** No. A B C
Resistance, ohms 5 250 500
Each 15.00 15.00 15.00
- F4457. **COIL SYSTEMS, Ballistic, for Nos. 4453-4.** No. A B C
Resistance, ohms 150 500 1000
Each 15.00 15.00 15.00
- F4458. **GALVANOMETER, L. & N., Type R,** a high sensitivity, high resistance instrument of rapid period, particularly designed for resistance measurements by the Wheatstone bridge method and for thermo-couple work. It is also well suited for precision measurements with the hydrogen electrode. The instrument is mounted on a bakelite base with large levelling screws, and is protected by a cylindrical housing finished in dull black japan. A large window in the housing permits observation of the working parts. A concave mirror 13 mm in diameter with a radius of curvature of one meter is attached to the coil for use with a lamp and scale such as our No. F4546 described on page 193.
- | | | |
|--------------------------------|-------|-------|
| No. | A | B |
| Coil resistance, ohms. | 40 | 500 |
| Sensitivity, megohms | 200 | 300 |
| Period, seconds | 5 | 3 |
| Each | 60.00 | 60.00 |
- F4462. **GALVANOMETER, Portable, Student's, with Inclined Scale.** This is a pivot-and-jewel type of moving coil galvanometer with pointer and scale giving a deflection of one scale division on a current produced by one volt thru 62,500 ohms. The scale is uniform and deflections are closely proportional to current. This galvanometer has the exclusive feature among instruments of this general description of having mounted upon its top three push-button keys, the use of which will protect it from damage which might otherwise result from excessive currents. Of the three push-buttons, the first connects a high resistance with the galvanometer, the second a resistance one-tenth as great as the first, and the third connects the galvanometer directly into line. In this manner it is possible to secure a quick indication as to the direction in which the Wheatstone bridge is unbalanced, and it enables the student to secure an approximate balance before connecting the unprotected galvanometer into the circuit. With directions for use. 13.50
- F4464. **GALVANOMETER, Portable.** This instrument was designed in response to a need which arose in connection with electrometric titration apparatus. There was not obtainable on the market at that time an instrument sufficiently sensitive to serve our purpose. The development of a galvanometer which would be sufficiently sensitive, and at the same time be portable and convenient in every respect, resulted in the instrument which is here offered. The moving system is suspended in a resilient mounting with phosphor-bronze suspensions, which are light enough to insure good characteristics, but strong enough to sustain even severe jolts. Period, $\frac{3}{4}$ seconds. Resistance, 750 ohms. Sensitivity, 3 to 4 megohms. An excellent instrument for use in measurements with the hydrogen electrode where extreme sensitivity is not desirable or necessary 25.00
- For other Galvanometers, see page 204.



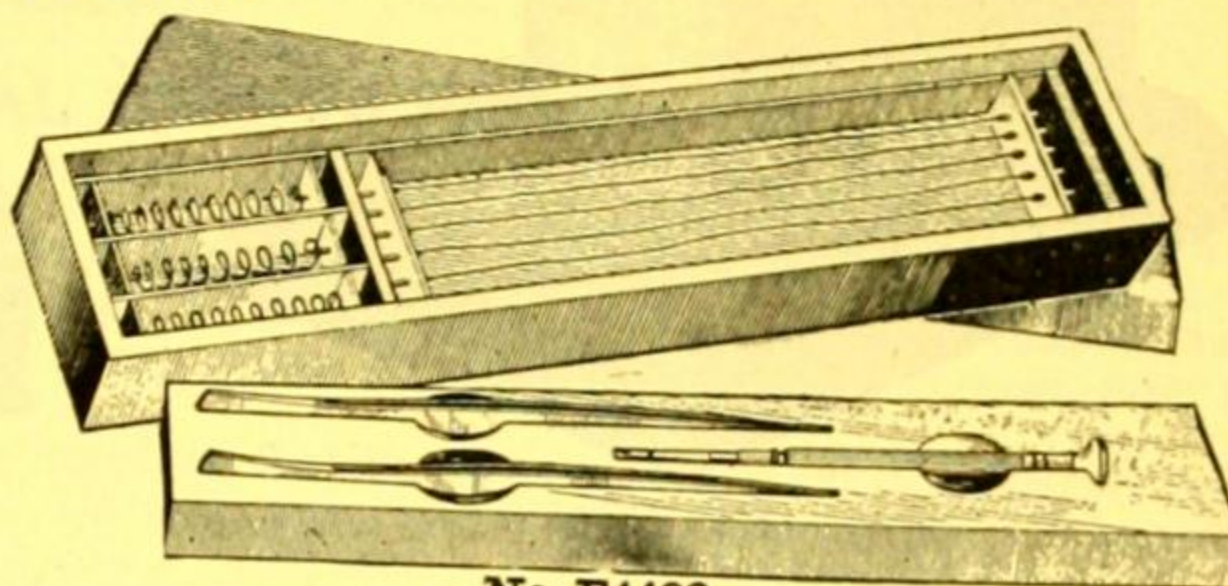
No. F4546.



No. F4547.



No. F4475.



No. F4482.

GALVANOMETER ACCESSORIES

F4546. LAMP AND SCALE, for reflecting galvanometers. Designed to give a brilliant image, visible in daylight in an average room. The ground glass scale, 6 cm x 60 cm, reading both ways from zero center, is mounted in a wood frame. The glass strip can be shifted through about 4 cm in the frame, permitting adjustment for zero setting. The frame is adjustable vertically through a range of about 25 cm.

The lamp mounting and housing are of improved design. The lamp is a 6 volt, 21 c. p. single contact automobile headlight bulb, obtainable at any garage or hardware store. The housing is light proof but well ventilated. The position of the lens is adjustable by means of a telescoping tube. When a plane mirror is used in the galvanometer, a direct image of the filament can be obtained on the scale and used as the index. It is more satisfactory, however, to use a concave mirror, or to mount a long focus lens in front of the plane mirror, and in this manner project on the scale an index consisting of a bright circular spot with a fine dark line on its vertical diameter.

To operate the lamp a 6 volt storage battery is most satisfactory. However, we can supply an adapter for operating the lamp on a 110 volt circuit, either A. C. or D. C. \$28.50

F4547. Lamp and Housing, only of No. F4546, with 6-volt, 21 c. p. lamp 11.00

F4548. Adapter for operating 6-volt lamp on 110 volt circuit 1.60

F4549. Lens, converging, unmounted, 1 meter focal length. Can be attached to galvanometer window with a bit of soft wax.35

F4475. UNIVERSAL SHUNT, suitable for use with any galvanometer, and therefore far more useful than the ordinary type of shunt. The total resistance is 5000 ohms, which is sufficiently high for use with any of the galvanometers listed in our catalogs. It is arranged for shunt powers of 1, 10, 100 and 1000, the different adjustments being made by use of a single plug. When the plug is at the zero position the main circuit is complete, but no current can flow through the galvanometer. Mounted in a brass case with wood base and hard rubber top. 25.00

F4482. D'ARSONVAL REPAIR KIT. Consists of a neat wooden box containing two pairs of forceps for handling suspensions, a watchmaker's screw driver, suitable for small screws on any galvanometer, 6 upper phosphor-bronze suspensions (see No. F4511) and 3 lower copper suspensions (No. F4483), all conveniently accessible. For use with No. F4453 Galvanometer.. 4.00

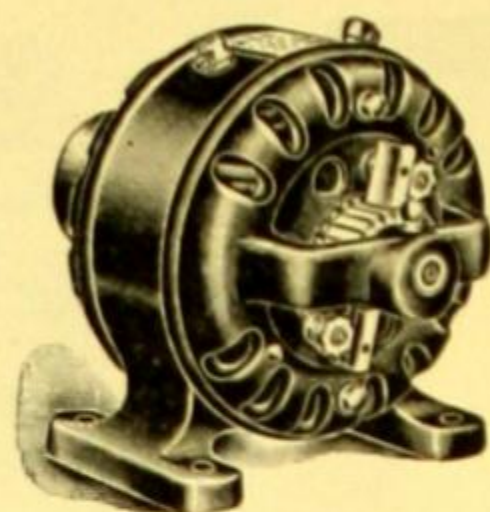
F4483. LOWER SUSPENSION only, copper, spiral form, as used on No. F4453 Galvanometer.... .20

F4492. GALVANOMETER MIRROR, plane, $\frac{5}{8}$ inch diameter45

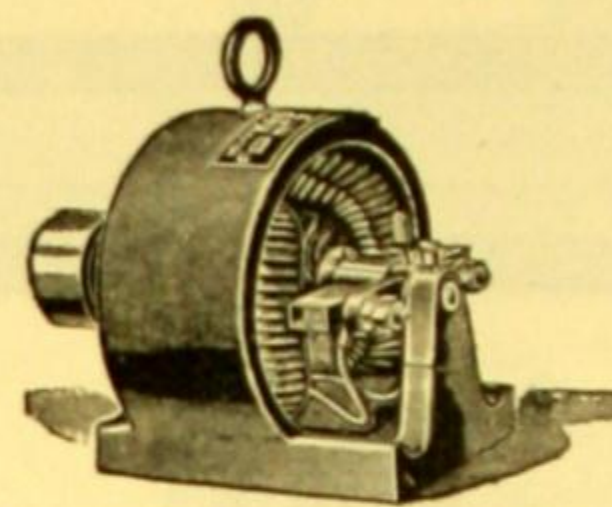
F4493. GALVANOMETER MIRROR, concave, 1 meter focus, $\frac{1}{2}$ inch diameter..... 1.35

F4511. GALVANOMETER SUSPENSION RIBBON, Phosphor Bronze, 0.001x0.013 inches.. Per foot .15

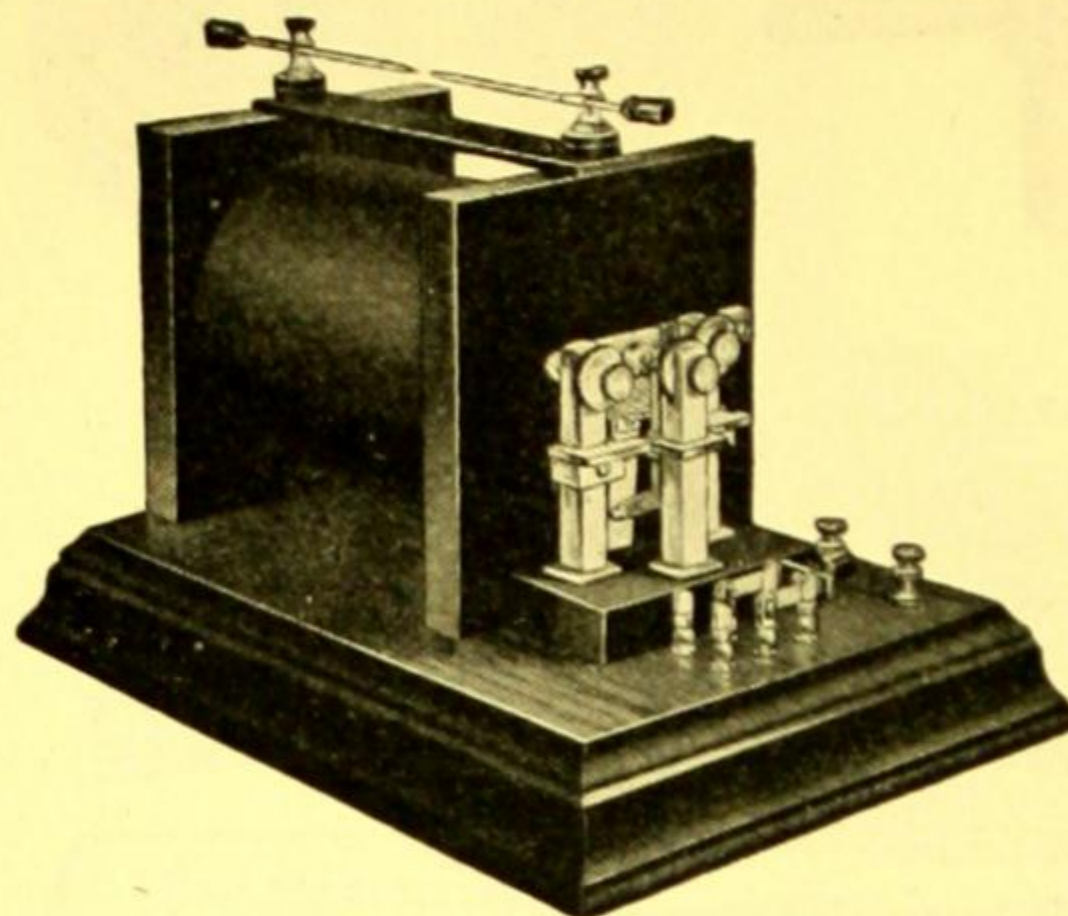
F4512. GALVANOMETER SUSPENSION RIBBON, Phosphor Bronze, 0.0007x0.005 inches.. Per foot .15



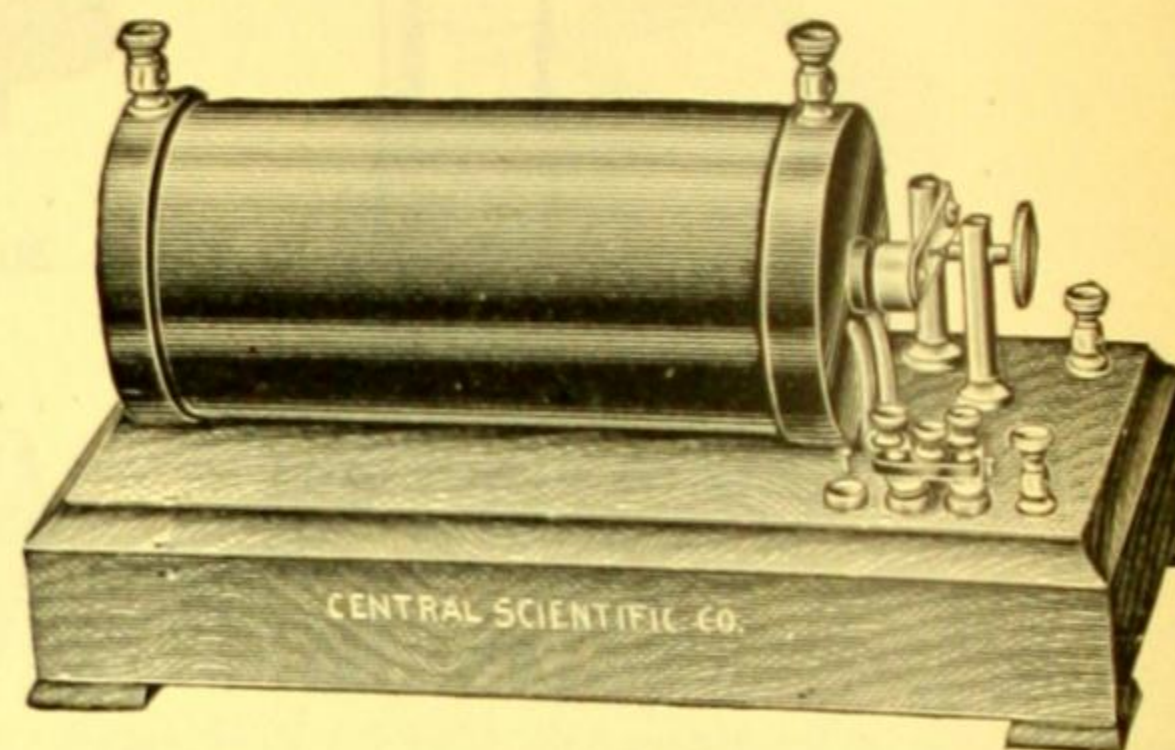
No. 4704.



No. 4708.



No. F3665.



No. F3681.

4704. **GENERATOR, Electric Charging and Plating Dynamo**, for charging storage batteries and electroplating. This is a shunt-wound dynamo with bi-polar field of the ring type, cast solid with the frame. The coils are form wound, carefully taped and shellacked; they are entirely safe from mechanical injury or breakdown. The armature is of the drum type, laminated, slot wound—it does not heat. The commutator is of hard copper, carefully insulated with mica. The brush holders are of new design, of the radial type, mounted on an adjustable yoke. The brushes are of woven wire, self-adjusting—they do not spark. The bearings are of hard bronze, nicely fitted; workmanship throughout the best. Finished in black enamel. Fitted with 2¼-inch flat pulley. Height overall, 6½ inches; length of shaft, 9 inches; weight, 23 lbs. Generates 7 volts, 11 amperes, at 2000 r. p. m. \$33.00
4708. **GENERATOR, Experimental Dynamo**. A shunt-wound dynamo particularly desirable for experimental purposes. It will light to full power twelve 6 volt 3 c. p. lamps. The construction is essentially the same as that of No. 4704, and it possesses the same excellent features, but is designed for a smaller energy output. Length of shaft, 6 inches. Weight, 9 pounds. Occupies space 6x4¼x6 inches. At speed of 2200 r. p. m., the output is 36 Watts (6 volts, 6 amperes) 12.00

HEATERS, see general heading **Heaters**.

HOT PLATES, see general heading **Hot Plates**.

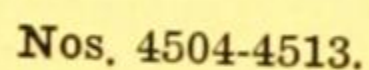
INCUBATORS, see general heading **Incubators**.

- F3665. **INDUCTION COIL**, equipped with a patented mechanical circuit breaker, which is mounted independently on a heavy piece of enameled slate. This makes the construction very rigid and increases the efficiency of the coil. The secondaries are built in sections and each section is wound in layers. Three special means of adjustment are provided, allowing a wide range of regulation, so that the coil is adapted for a large variety of work. Complete with a double pole, double throw knife switch. The 150 mm coil will produce a heavy 150 mm spark with an input of 4 volts, 6 amperes (24 watts); the other coil takes a proportional input.

No.	B	C
Spark length, mm.	75	150
Each	50.00	85.00

- F3681. **INDUCTION COIL**, with adjustable vibrator or interrupter, commutator and condenser, wound with insulated wire. (The coils ordinarily sold are wound with bare wire.) Mounted on finely polished mahogany box.

No.	A	B	C	D
Spark length, mm.	6	13	18	25
Each	8.00	12.00	15.00	20.00



After nearly a year of development work in bringing into harmony scientific correctness, dependable performance under severe conditions and low cost of construction which would permit the lowest possible selling price for a good instrument, we are ready to announce our improved line of portable direct current moving coil ammeters and voltmeters. We are so certain of their high quality that we have no hesitation in guaranteeing them as better from every point of view than any instrument now obtainable at anywhere near the same price.

The Magnet is made of chrome steel, properly aged, so that it will retain its magnetism permanently without change under ordinary conditions of use. Its ends are ground to uniform inside width, which insures uniformity of air gap in all instruments.

The Pole Pieces and Core are carefully machined from annealed stock which has been selected after many experiments as the most suitable for producing a **uniform magnetic field in the air gap** throughout the range of deflection. This insures uniformity of scale divisions over the entire range.

The Moving System, consisting of coil, springs and pointer is balanced on hardened steel pivots between sapphire jewels. The **Coil** is wound on an aluminum frame which makes it very light, yet it is sufficiently rugged to withstand hard bumps without cracking the jewels. The **Springs** are phosphor bronze. The **Pointer** is of aluminum tubing with a knife edge at its indicating end; the edge is colored red, to permit easier reading by contrast with the lines of the scale. A zero-setting device is provided. **The Scale** is uniform, covering full 90 degrees of arc, with a length of 4 5/8 inches (119 millimeters). This is the 100 Division

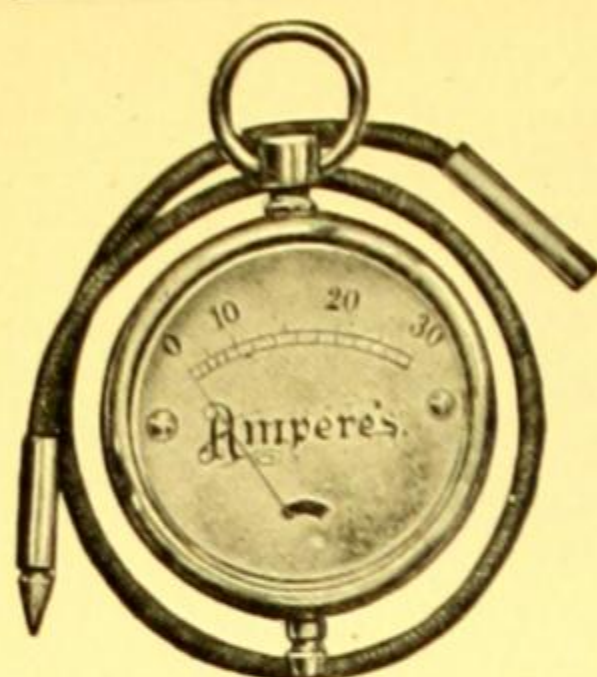
The Scale is uniform, covering full 90 degrees of arc, with a length of 4 5/8 inches (120 millimeters). Thus, in the 100-division instruments each division is approximately 1.2 mm long. This makes possible a precision of reading that cannot be attained in small pattern instruments. The scale, pole-pieces, core and moving system form a rigid unit, between the parts of which no relative displacements are possible. This insures permanency of calibration. The sensitivity is approximately 200 millivolts for a full scale deflection.

The **External Design** is a pleasing departure and radical improvement from the usual pattern of instrument offered at a price as low as this. The base is of black molded insulating material, and the case is handsomely finished with dull black japan (rubber finish). Binding posts are insulated on voltmeters and nickel-plated on ammeters. A window of generous size in the case enables the student to see the construction and operation of the moving system.

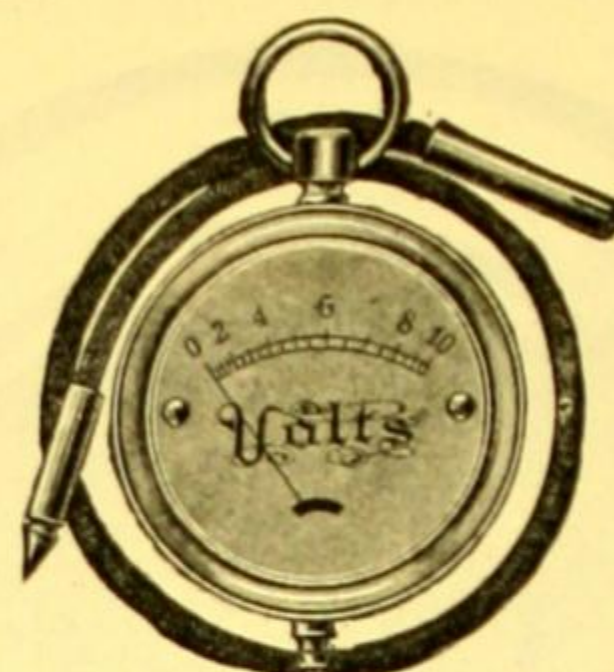
Ammeters, voltmeters and volt-ammeters are carried in the ranges listed below. In each instrument the calibration is guaranteed to 1 per cent. of the full scale.

For Nos. 4492-4-6 Ammeter, Voltmeter and Volt-Ammeter, see page 196.

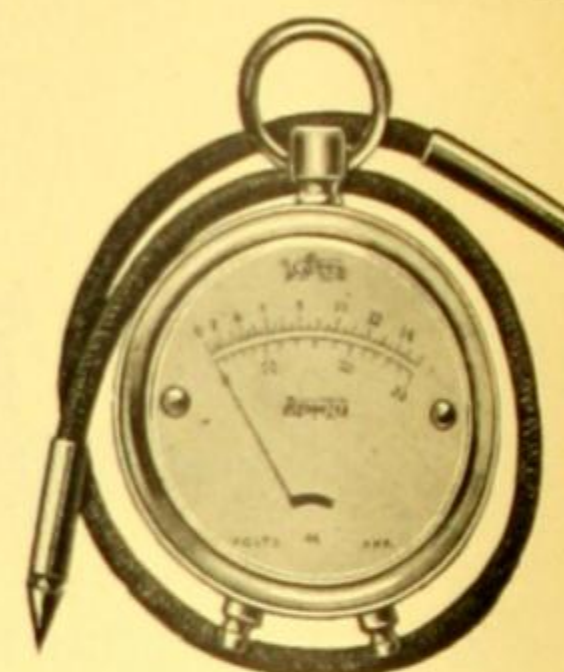
195



No. 4492.



No. 4494.

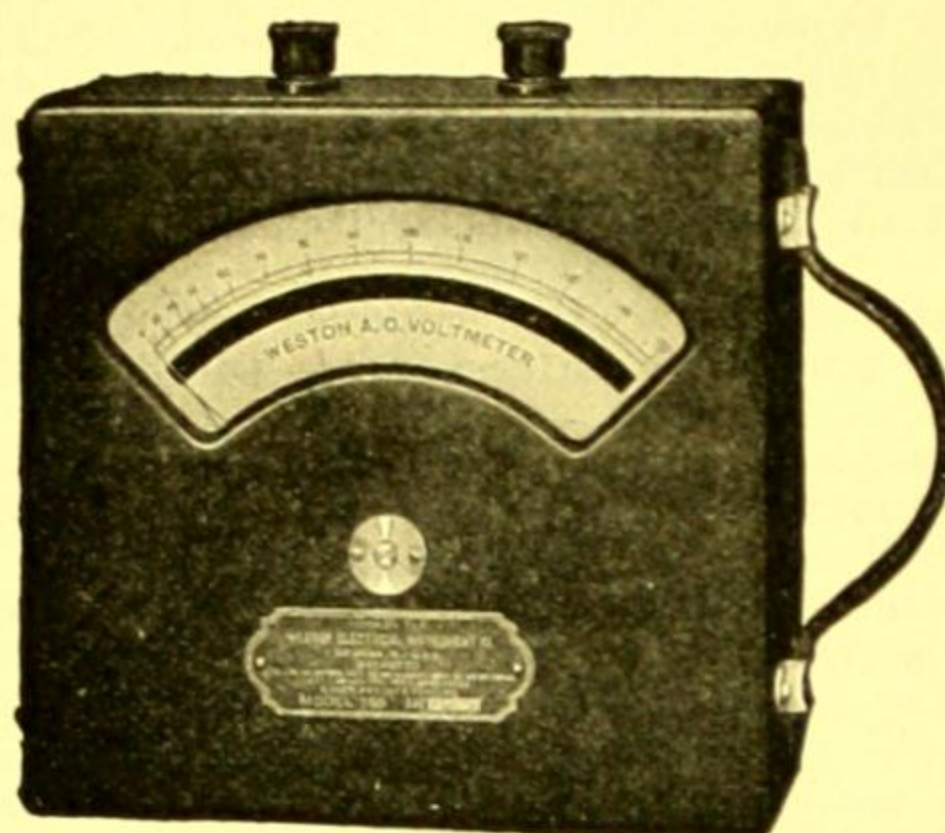


No. 4496.

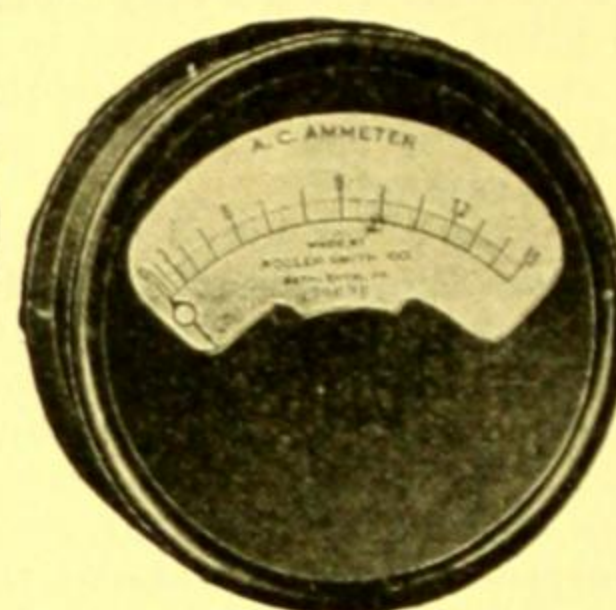
METERS, POCKET D. C.

These meters are extensively used for rapidly measuring the voltage and amperage of batteries. They are exceedingly dead beat. They can also be used as **polarity indicators** for any direct current since they will not give a reading unless the terminal at the bottom is in contact with the positive terminal of the circuit under test. Each instrument is packed in a cloth bag in a paper carton.

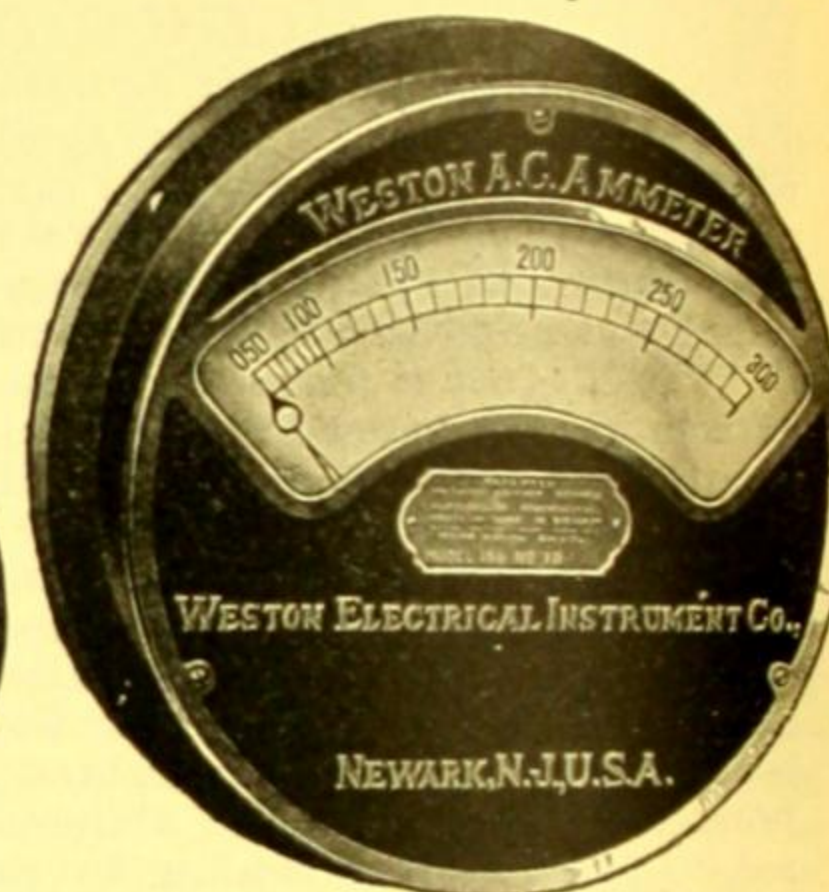
4492.	AMMETER.	Range 0-40 amperes.....	\$1.00
4494.	VOLTMETER.	Range 0-10 volts.....	1.10
4496.	VOLT-AMMETER.	Range 0-10 volts and 0-40 amperes	1.30



Model 155.



No. 4524E.



Model 156.

METERS, IMPERIAL—ALTERNATING CURRENT.

METERS, Switchboard. Standard electromagnet construction, hand calibrated scales, which, as in all A. C. Meters, cannot be used with great accuracy over the first 20 or 25 per cent of their range. Best quality jewel and pivot bearings; brass case, finished in baked enamel and dust proof. Diameter, 4 inches.

4524.	AMMETERS.					
	No.	B	C	D	E	F
	Range, amperes	3	5	10	15	30
	Smallest division, amperes.....	0.05	0.1	0.2	0.25	0.5
	Each	\$14.85	14.85	14.85	16.20	16.65
4526.	VOLTMETERS.					
	No.		C	E	F	
	Range volts		30	150	250	
	Smallest division, volts.....		0.5	2.5	5	
	Each		15.30	18.00	19.80	

METERS, WESTON—ALTERNATING CURRENT.

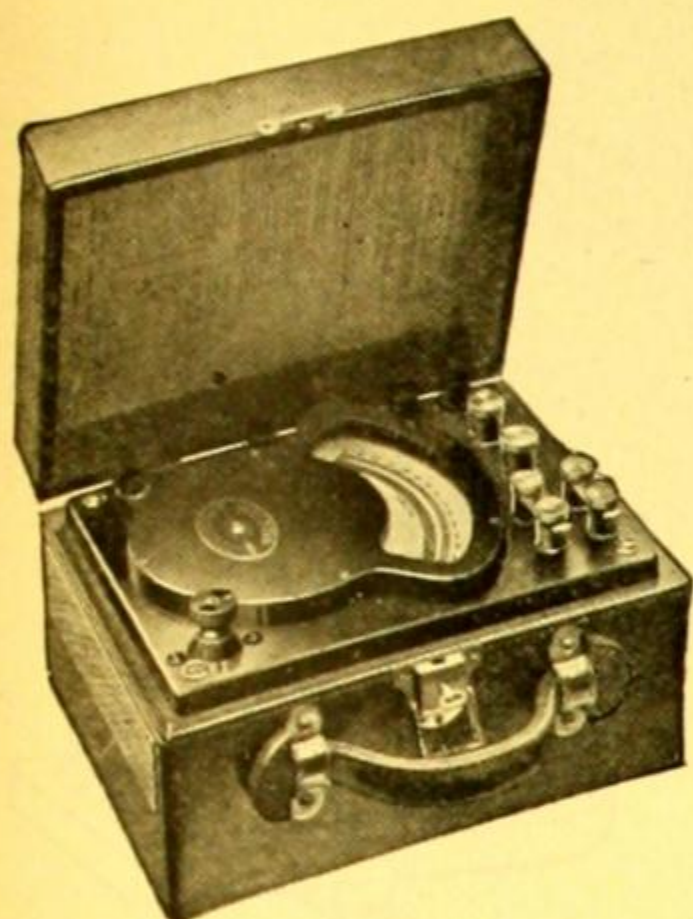
METERS, Portable, Model 155. These instruments are perfectly dead beat, extremely sensitive and quickly and accurately respond to the most minute as well as to the greatest fluctuations in current strength, or in potential difference. They may be used on circuits of any frequency, within the limits of engineering practice of today, without sensible error in their indications. Provided with hardened steel pivots, jeweled bearings and mounted in neatly finished dust-proof wood cases. Dimensions $7 \times 7\frac{1}{4} \times 3\frac{1}{4}$ inches.

4532.	AMMETER, 0-10 amperes.....	31.25	4540.	VOLTMETER, 0-125 volts.....	33.75
4534.	AMMETER, 0-25 amperes.....	31.25			

METERS, Switchboard, Model 156. These instruments are of a high standard of excellence, indicate the same whether left in circuit for a minute or permanently, may be used on circuits of any ordinary frequency, are entirely dead beat, and are provided with a remarkably uniform scale. Diameter of case, 7.25 inches; depth of case, 3.15 inches.

4546.	AMMETER, 0-10 amperes.....	22.25	4550.	AMMETER, 0-50 amperes.....	22.25
4548.	AMMETER, 0-25 amperes.....	22.25	4556.	VOLTMETER, 0-130 volts.....	24.00

METERS, WESTON— (CONTINUED).



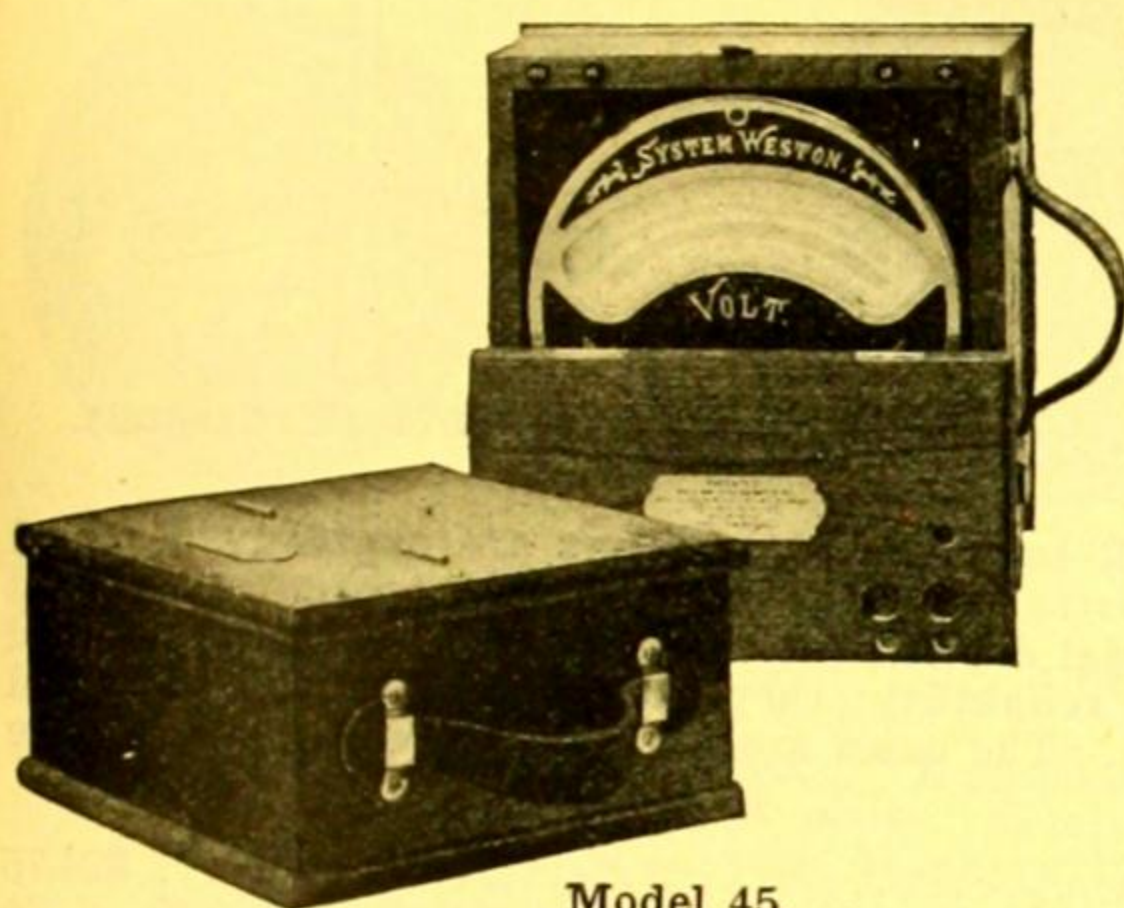
Model 310.

WATTMETERS, Portable, Single-phase, Model 310.

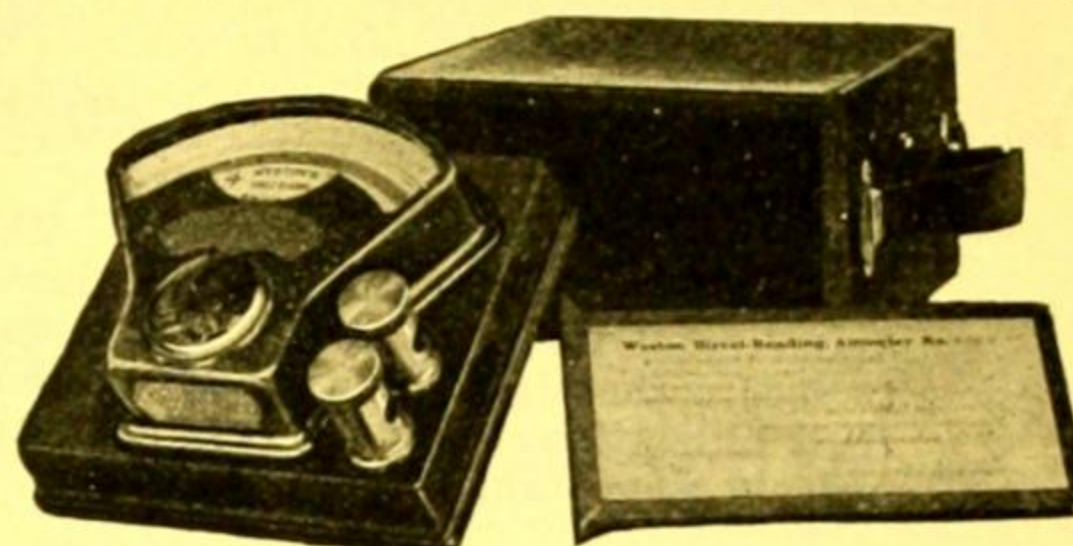
These instruments represent the latest development in electro-dynamometer wattmeters and have the same general description as the Model 370 Ammeter described on page 210. The field coils are designed to stand double their normal capacity continuously, and the potential circuits a voltage of $1\frac{1}{2}$ times their normal value. A reversing switch is provided by means of which the direction of the current through the movable coil may be changed without changing the direction through the rest of the potential circuit. This makes it possible to obtain a positive deflection without changing connections. The scales are uniform throughout their entire length. For both Alternating and Direct Current.

4584. **WATTMETERS**, Single-phase, double voltage and current ranges. Rated voltages of 200 and 100 volts, but will stand 300 and 150 volts without any damage.

No.	B	C	D
Normal amperes, series.....	2.5	5	10
Normal amperes, multiple....	5	10	20
Maximum amperes, series...	5	10	20
Maximum amperes, multiple.	10	20	40
Kilowatts, field coils in series	0.5/0.25	1/0.5	2/1
Kilowatts, field coils in multiple	1/0.5	2/1	4/2
No. of scale lines.....	100	100	100
Each	\$123.75	123.75	123.75



Model 45.



Model 1.

DIRECT CURRENT.

METERS, Portable, Model 45. These instruments are of sufficient accuracy for station work and general testing. The movement is completely enclosed in an iron case (which protects it from stray magnetic fields), securely fastened in a wooden carrying box. This box is provided with a hinge cover which protects the scale and binding posts.

Nos. 4602-6 Meters are provided with self-contained shunt.

No. 4608 Meter has an external shunt.

4600.	MILLIAMMETER , range 0-100 ma. in 1.0 ma. divisions	41.25
4602.	AMMETER , range 0-5 amperes in 0.05 ampere divisions	41.25
4604.	AMMETER , range 0-15 amperes in 0.1 ampere divisions	41.25
4606.	AMMETER , range 0-25 amperes in 0.2 ampere divisions	42.00
4608.	AMMETER , range 0-50 amperes in 0.5 ampere divisions	42.00
4610.	MILLIVOLTMETER , range 0-50 mv. in 0.5 mv. divisions	41.25
4612.	VOLTMETER , range 0-5 volts in 0.05 volt divisions	41.25
4614.	VOLTMETER , range 0-15 volts in 0.1 volt divisions	41.25
4616.	VOLTMETER , range 0-150 volts in 1.0 volt divisions	48.75

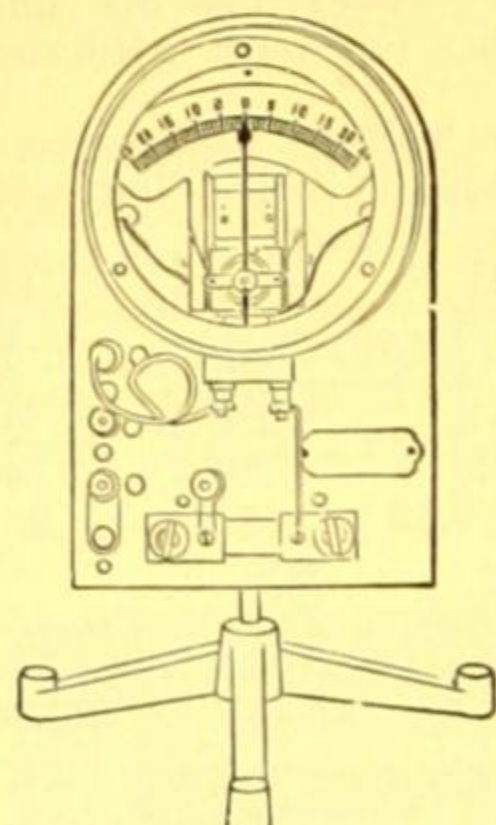
NOTE.—Double Scale Voltmeters of the above type will be furnished at a price of \$6.25 in addition to the price of the highest range.

METERS, Portable, Standard, Model 1. These meters are adjusted and calibrated with the greatest care, and when used properly give exceedingly accurate results. They are direct reading, portable, permanent, and "dead beat," and are, in fact, the recognized standard instruments for laboratory and general testing.

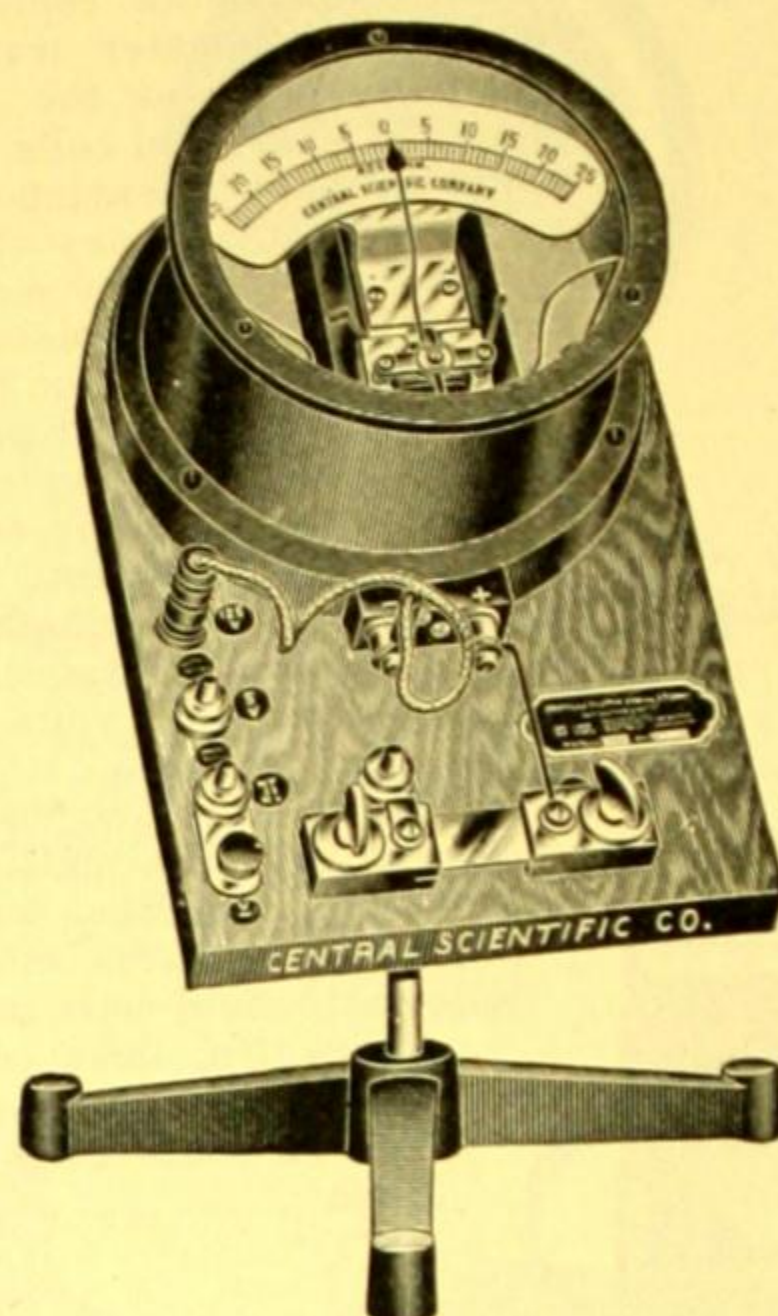
4626.	AMMETER , range 15 amperes, in 0.1 ampere divisions, readable to 0.01 ampere.....	81.25
4630.	AMMETER , range 50 amperes, in 0.5 ampere divisions, readable to 0.05 ampere.....	81.25
4636.	MILLIVOLTMETER , zero center, double range, 10-0-10 and 100-0-100 mv., supplied with key by which either range may be employed.....	68.75
Any of the above MILLIVOLTMETERS may be supplied equipped for Shunts for ampere readings at an additional cost.		
4638.	VOLTMETER , range 150 volts in 1 volt divisions, readable to 0.1 volt.....	68.75
4640.	VOLTMETER , double range, 150 volts readable to 0.1 volt and 15 volts readable to 0.01 volts.....	93.75



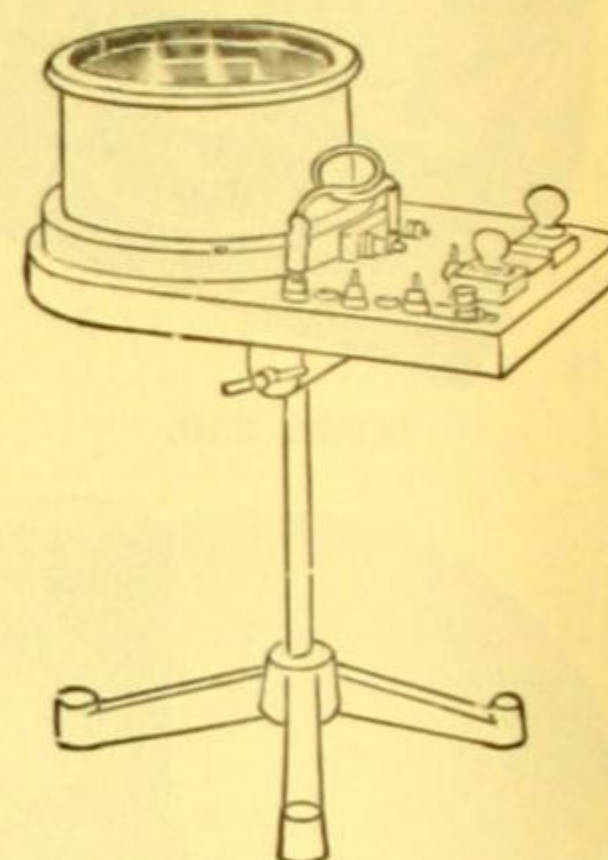
Model 24.



No. 4674 (Vertical).



No. 4674.



No. 4674 (Horizontal).

METERS, Switchboard, Model 24. These small round pattern meters are expressly designed to meet the demand for good but low price instruments for use on switchboards. The total diameter of the front is $6\frac{5}{8}$ inches and the total depth 4 inches. They are carefully designed to secure the highest degree of durability and reliability; they are absolutely dead beat, and their indications can be relied upon within 1%. The cases are finished in black japan and are neat in appearance.

4652.	AMMETER, 0-10 amperes in .2 ampere divisions	\$24.75
4654.	AMMETER, 0-25 amperes in .5 ampere divisions	25.50
4656.	AMMETER, 0-50 amperes in 1 ampere divisions	25.75
4658.	VOLTMETER, 0-10 volts in .2 volt divisions	26.50
4660.	VOLTMETER, 0-25 volts in .5 volt divisions	26.50
4662.	VOLTMETER, 0-50 volts in 1 volt divisions	26.50
4664.	VOLTMETER, 0-130 volts in 2 volt divisions	27.25

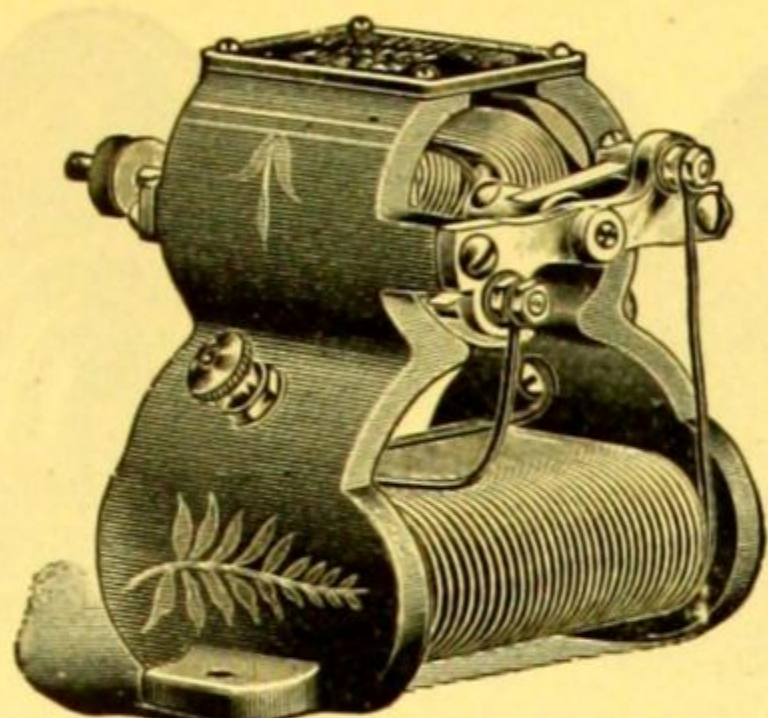
METERS, WESTON—(CONTINUED).

METER, LECTURE TABLE, D. C.

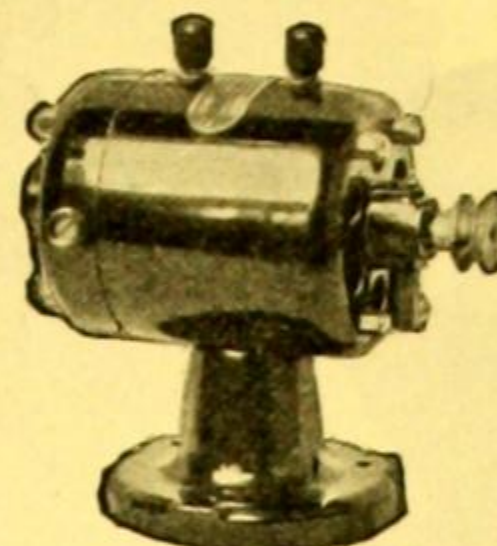
4674. **GALVANO-VOLT-AMMETER.** Combines six different electrical measuring instruments:

- (1) Galvanometer.
- (2) Milli-Voltmeter, range 25-0-25 mv. in 1 mv. divisions.
- (3) Mil-Ammeter, range 25-0-25 ma. in 1 ma. divisions.
- (4) Voltmeter, range 5-0-5 volts in 0.2 volt divisions.
- (5) Voltmeter, range 125-0-125 volts in 5 volt divisions.
- (6) Ammeter, range 25-0-25 amperes in 1 ampere divisions.

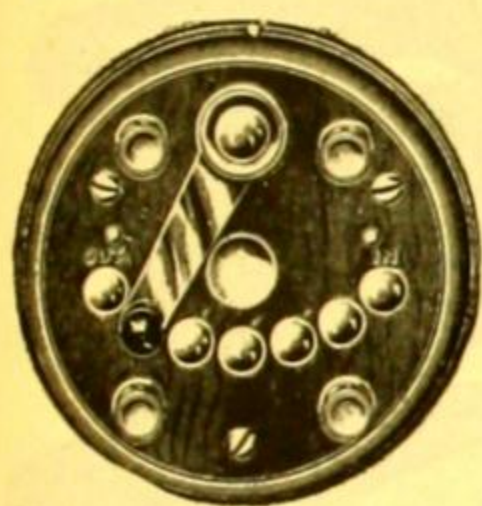
The zero is in the center of the scale so that no time need be wasted in determining the positive terminal of a circuit. It is so mounted that it may be used in either of THREE POSITIONS—vertical, horizontal, or inclined at a convenient angle. (These positions are shown in the illustrations above.) The working parts are fully exposed to view and all connections may readily be traced. It is an extremely sensitive instrument, and having no suspensions, mirrors or adjustments to get out of order, is always ready for use. Among many uses are the following: The MEASUREMENT OF VOLTAGE, AMPERAGE AND RESISTANCE OF BATTERIES; the DETERMINATION OF RESISTANCE, CONDUCTIVITY, etc., of the various metals; the MEASUREMENT OF THE THERMO-ELECTRIC EFFECTS of different metals; as a CURRENT INDICATOR IN WHEATSTONE BRIDGE WORK; and as a LECTURE TABLE GALVANO-METER. Diameter of dial, $6\frac{1}{2}$ inches; height of figures, $\frac{1}{4}$ inch..... 52.50



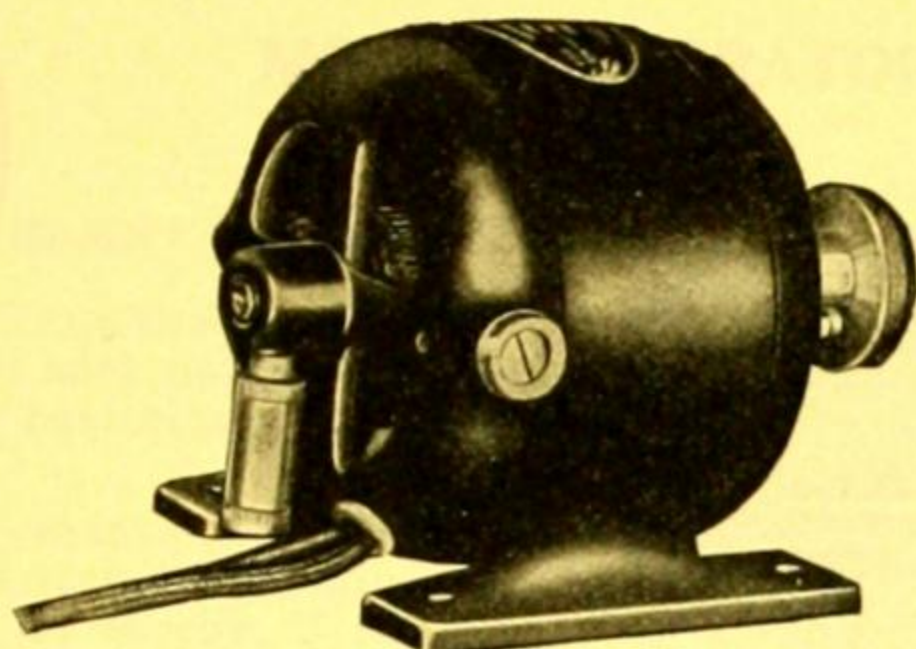
No. 4716.



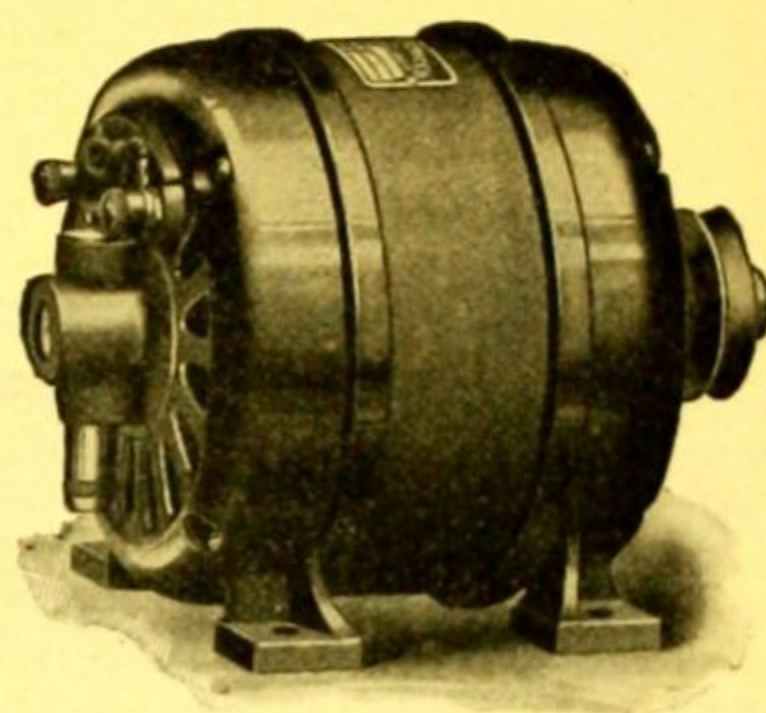
No. 4720.



No. 4724.



No. 4746.



Nos. 4730-31.

MOTORS

4716. **MOTOR, Porter Battery No. 1.** A standard article, perfect in every detail of design and construction, and accurately made. Nicely finished in black enamel. 1/100 h. p., 1.5-3 volts, 1.5 amperes, 5500 r. p. m.; size, $3\frac{1}{4} \times 3\frac{1}{4} \times 3\frac{1}{4}$ inches; weight, $1\frac{1}{2}$ lbs. \$4.25
4717. **MOTOR, Porter Battery No. 2.** Same as No. 4716, but 1/90 h. p., 3-5 volts, 2 amperes, 4000 r. p. m.; size, $3\frac{3}{4} \times 4 \times 4\frac{1}{4}$ inches; weight, $2\frac{3}{4}$ lbs. 7.25
4720. **MOTOR, Universal.** This motor may be used on 110 volt either Alternating (60 cycle) or Direct Current. Will develop approximately 1/50 h. p., is efficient and will not heat up when operating on either circuit. It is constructed in a substantial manner, having laminated fields and armature and a twelve-section copper commutator. It uses a $\frac{3}{16}$ -inch carbon brush and is equipped with compression grease cups and bronze bearings which insure perfect lubrication. It weighs $4\frac{1}{4}$ pounds, is $6\frac{1}{4}$ inches high and consumes about the same amount of current as one 8 candle power lamp. 12.00

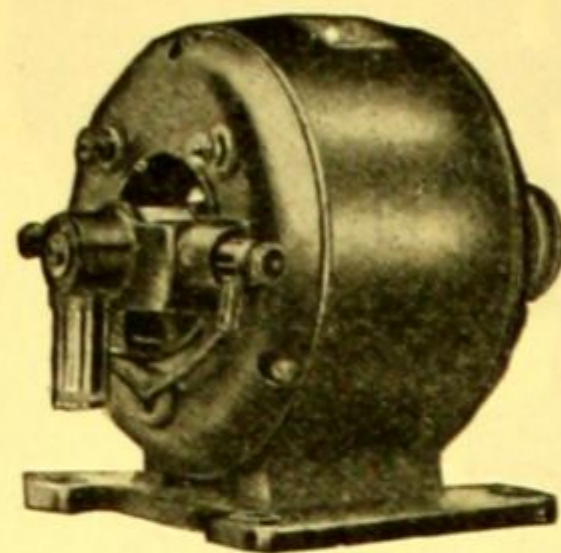
4724. **BATTERY RHEOSTAT**, for regulating the speed of small motors, and also for use with miniature battery lamps. This rheostat is nicely finished with nickel trimmings and rubber handle. Resistance, 0 to 5 ohms. 1.80

4726. **MOTORS, Alternating Current, series wound**, for light work and intermittent service in the laboratory. Especially valuable for operating shakers, stirrers, rotating electrodes, etc. For 110 volt 60 cycle circuits.

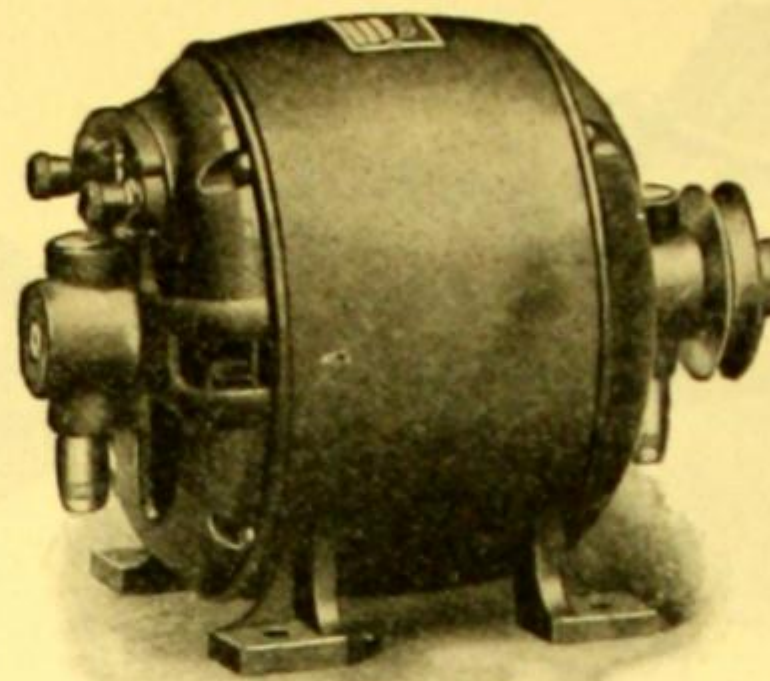
No.	C	E	G
H. P.	1/100	1/50	1/25
Speed at full load, r. p. m.	2200	1800	1800
Diameter of V-groove pulleys, inches.	$\frac{5}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$
Shipping weight, lbs.	10	15	24
Each	12.00	15.00	18.50

MOTORS, Alternating Current, split-phase induction type, for constant speed and continuous service requiring the expenditure of more energy than can be obtained from No. 4746. For use on 60 cycle circuits. Pulley is grooved for $\frac{1}{4}$ to $\frac{5}{8}$ inch round belt.

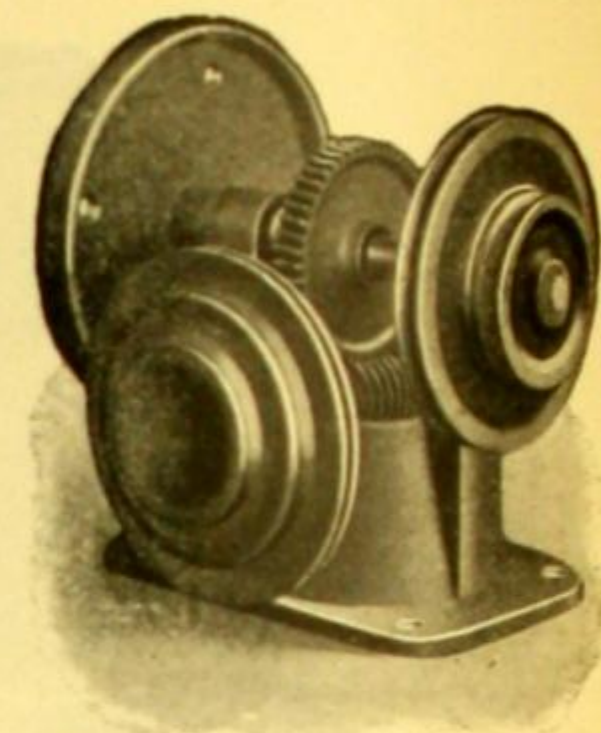
No.	A	C	E	G
H. P.	1/20	1/12	$\frac{1}{8}$	$\frac{1}{4}$
Speed, r. p. m.	1725	1725	1725	1725
Diameter of pulley, inches.	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{7}{8}$	$2\frac{1}{2}$
Shipping weight, lbs.	20	24	26	36
4730. Each, for 110 volts.	17.00	19.00	20.00	25.00
4731. Each, for 220 volts.	18.00	20.00	21.00	26.00



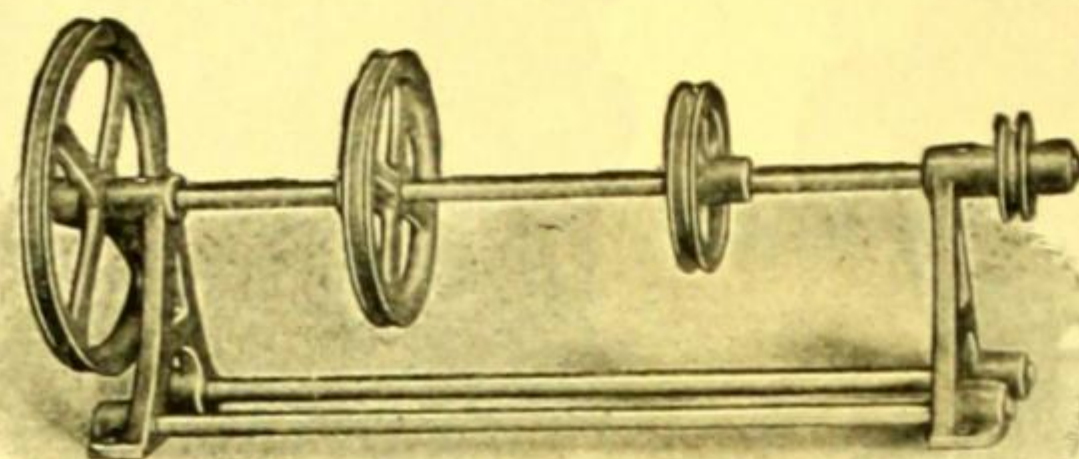
No. 4748.



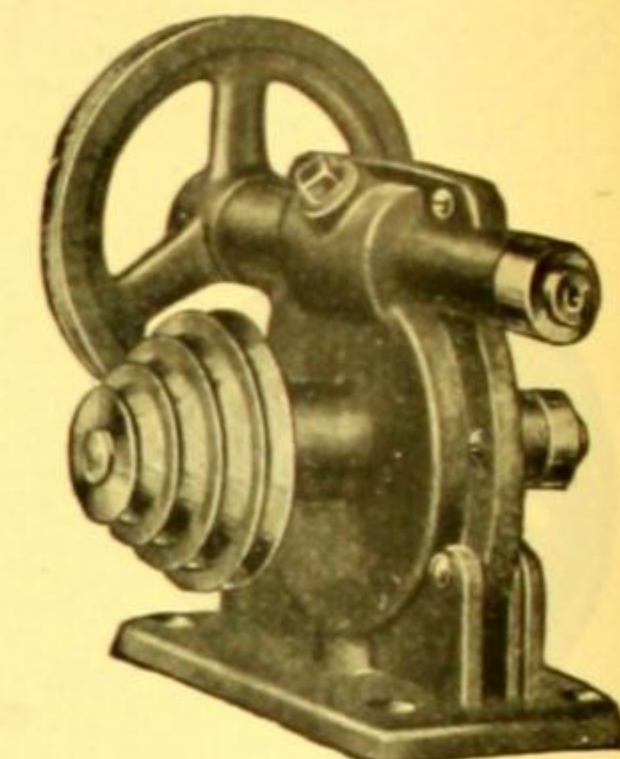
Nos. 4776-7.



No. 4814.



No. 4810.



No. 4816.

4748. **MOTORS**, Direct Current, series wound, similar to No. 4746, but wound for 110 volts direct current. Suitable for light work and intermittent service.

No.	D	F	H
H. P.	1/100	1/50	1/25
Speed, r. p. m.	2200	1800	1800
Diameter of V-groove pulley, inches	5/8	1 1/4	1 1/4
Shipping weight, lbs.	10	15	24
Each	\$12.00	15.00	18.50

MOTORS, Direct Current, shunt wound, for purposes requiring constant speed over long periods of time. Useful for operating blowers, vacuum pumps, shaking machines, small grinding mills, etc. Pulley is grooved for 1/4 to 1 1/8 inch round belt. Size D is compound wound; the others shunt.

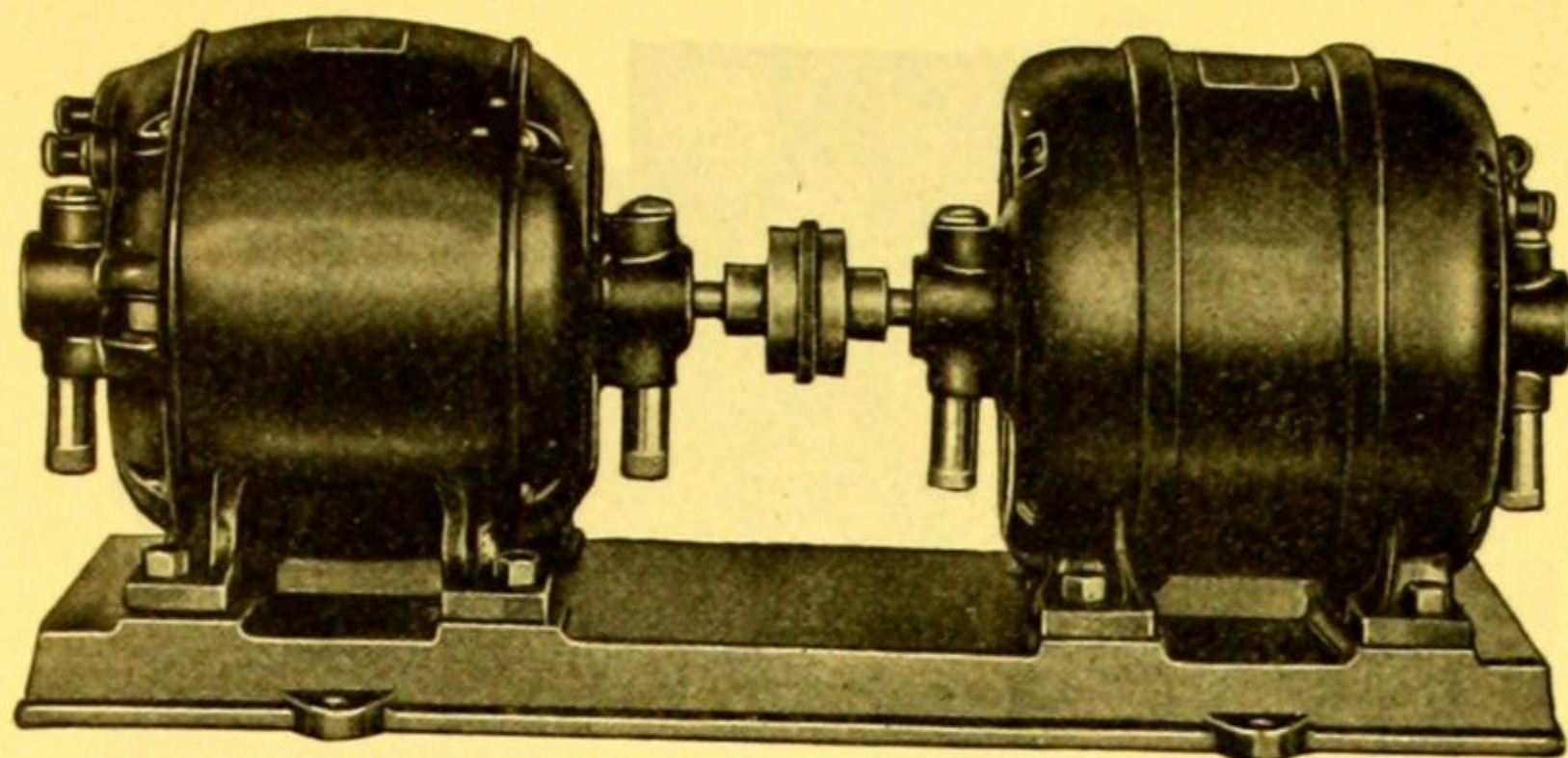
No.	A	B	C	D
H. P.	1/20	1/12	1/6	1/4
Speed, r. p. m.	1725	1725	1725	1725
Diameter of pulley, inches	1 1/4	1 3/8	2	2 1/2
Shipping weight, lbs.	18	22	25	28
4776. Each, for 110 volts	19.00	21.00	23.00	28.00
4777. Each, for 220 volts	20.00	22.00	24.00	29.00

4810. **COUNTERSHAFT**, 1/4 inch in diameter and 12 inches long, with bearings and pulleys 1, 2, 3 and 4 inches in diameter. The pulleys are bored and grooves turned true with the shaft, to which they are fastened with set screws, so that their position on the shaft may be changed. Used in connecting small engines and motors with other machinery. 2.50

4814. **SPEED REDUCING GEAR**. An improved device by which the high speed of an engine or motor is converted into a slow, powerful motion. The round plate may be removed, if desired, and direct connection made to shaft. Geared 48 to 1. Pulleys grooved for 3/2-inch round belt. The fast running pulley has diameters 2, 3 and 4 inches, and the slow running pulley diameters 2 and 4 inches, thus giving a wide range of speeds. 7.00

4816. **SPEED REDUCING GEAR**. Similar to No. 4814, but with the gear enclosed in a case which is filled with grease so that the gear will run silently and without attention for a long time. Geared 48 to 1. Pulleys grooved for 3/2-inch round belt. The fast running pulley is 4 inches in diameter and the slow running pulley has diameters 1, 1 1/2, 2 and 2 1/2 inches, thus giving a wide range of speed. 10.50

For other **MOTORS** in addition to those listed, see Nos. 2361, 2362 and 12860.



No. 4826-4835.

MOTOR GENERATORS

A. C. to D. C.

FURNISH DIRECT CURRENT WHEREVER THERE ARE ALTERNATING CURRENT MAINS.

For the convenience of institutions which have available only alternating current and which need a source of direct current for such purposes as electrolytic analysis, operating induction coils for spectrum analysis, charging storage batteries, etc., we offer the motor generator sets listed on this and the following page.

In selecting a motor-generator, it is important to remember that the wattage output is fixed for each size and that the voltage selected determines the amperes of current obtainable. For example, in a generator producing 90 watts of energy, if the generator is ordered wound for 12 volts, the maximum amperage obtainable is $7\frac{1}{2}$. It should also be kept in mind that the intensity of the current in amperes which will flow through an induction coil or an electrolytic solution is the quotient of the voltage divided by the resistance of the circuit. Some idea may be gained of the comparative amount of energy delivered by one of these outfits from a consideration of the fact that a hand-feed arc lamp, such as is used for microscopic illumination uses about 200 watts; a Mazda lamp in a small projection lantern, 400 watts; a 6-volt storage battery being charged, about 45 to 60 watts; and a single electrolytic cell, from 2 to 100 watts in the case of a rotating anode. Another point to consider, especially in planning an equipment for electro-analysis, is that when several units (electrolytic cells or storage batteries) are connected in parallel to the generator for use simultaneously, the total current drawn from the generator is the sum of the currents in the several units.

A generator should always be selected for the maximum service which it may be called upon to render, since the difference in initial cost is comparatively small as compared with the cost of replacing a burned out coil.

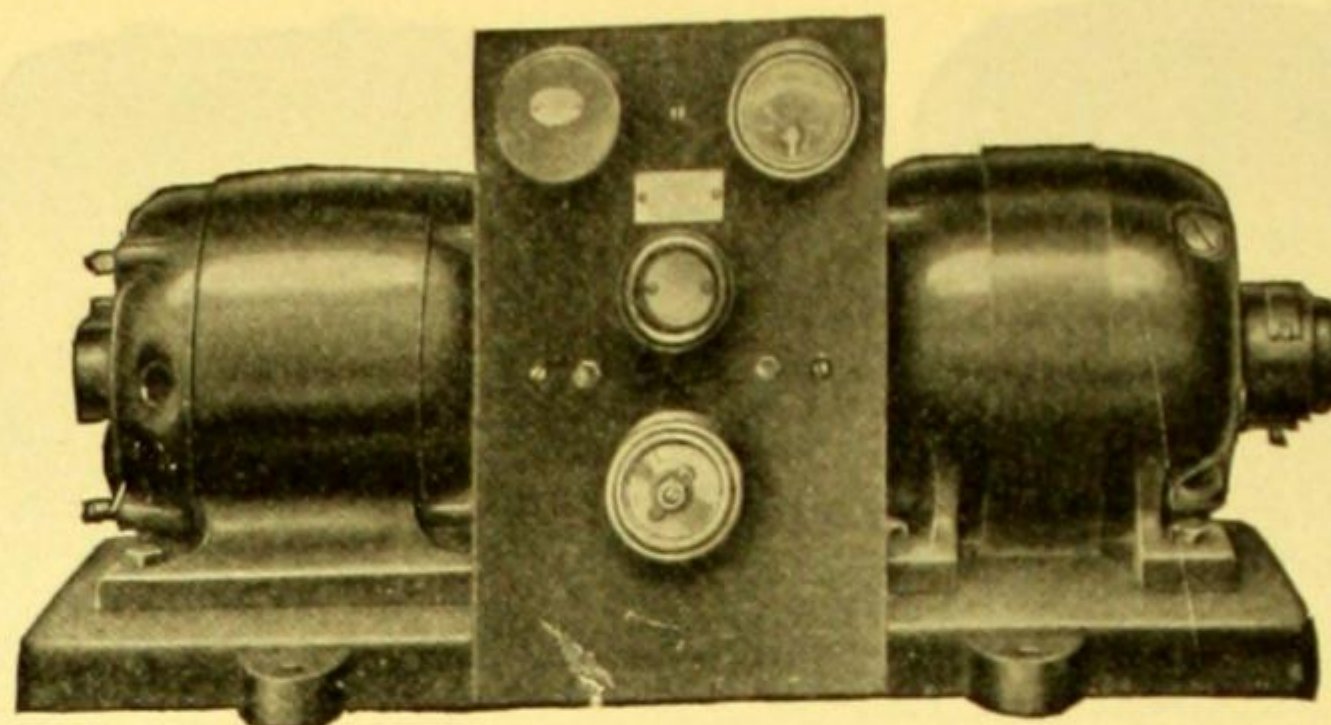
The outfit shown on the following page, with switchboard equipped with ammeter and automatic cut-out, are strongly recommended, especially for charging storage batteries, since it is impossible to damage either the generator or the battery by connecting the battery to the generator before the latter is started.

Specifications.

Generator shunt wound.	Useful for battery charging.
Generator and motor direct connected and mounted on same base with flexible coupling.	Generous size bearings equipped with wick oilers.
Motor is well ventilated.	Heavy four arm bearing flanges with ample ventilating ducts.
Radial brushes set on neutral. Reaction type brushholders used.	The voltage chosen may be varied 25% above and below normal rating by means of the field rheostat furnished with each set.
No sub-base required. Sets may be bolted direct to support.	
No starting box needed.	

MOTOR GENERATOR, A. C. to D. C. With single phase, 60-cycle motor, and generator wound for any voltage from 6 to 250 volts D. C. (State voltage desired when ordering.)

No.	A	B	C
Output, watts	40	90	150
Floor space occupied, inches	8x17	8x19	8x19
Speed, r. p. m.	1725	1725	1725
Shipping weight, lbs.	80	90	105
4826. MOTOR GENERATORS, with 110 volt motor	\$70.00	78.00	88.00
4827. MOTOR GENERATORS, with 220 volt motor	72.00	80.00	90.00



Nos. 4842-4848.

MOTOR GENERATORS, D. C. to D. C.

Sets with the same features as those described on preceding page are listed for service on 110 or 220 volts direct current for producing any desired direct current voltage.

MOTOR GENERATORS, D. C. to D. C. With direct current motor, shunt wound, and generator wound for any voltage from 6 to 250 volts D. C. (State voltage desired when ordering.)

No.	A	B	C
Output, watts	40	90	150
Shipping weight, lbs.....	80	90	105
4834. MOTOR GENERATORS , with 110 volt motor	\$64.00	72.00	82.00
4835. MOTOR GENERATORS , with 220 volt motor	66.00	75.00	85.00

MOTOR GENERATORS with Switchboard. These motor generators will meet the demand for a self contained outfit for the laboratory, which may be used to furnish the regular laboratory current and is especially valuable for battery charging. The outfits consist of a **Motor Generator Set** similar to the type described on page 201, with the generator for 24 volts D. C., and a steel switchboard panel, mounted as in the illustration and having the following

Specifications.

Automatic cutout switch on sets with A. C. motors to prevent discharge of batteries through generator.	Separate snap switches on sets with D. C. motors for motor and generator circuits.
Snap switch on sets with A. C. motors which simultaneously opens and closes motor and generator circuits.	D. C. motor starting switch connects motor to line through a starting resistance which is cut out by turning switch to next position as motor gains speed.
Ammeter for reading charging current.	Rheostat for adjusting charging current.
	Field rheostat for adjusting voltage.

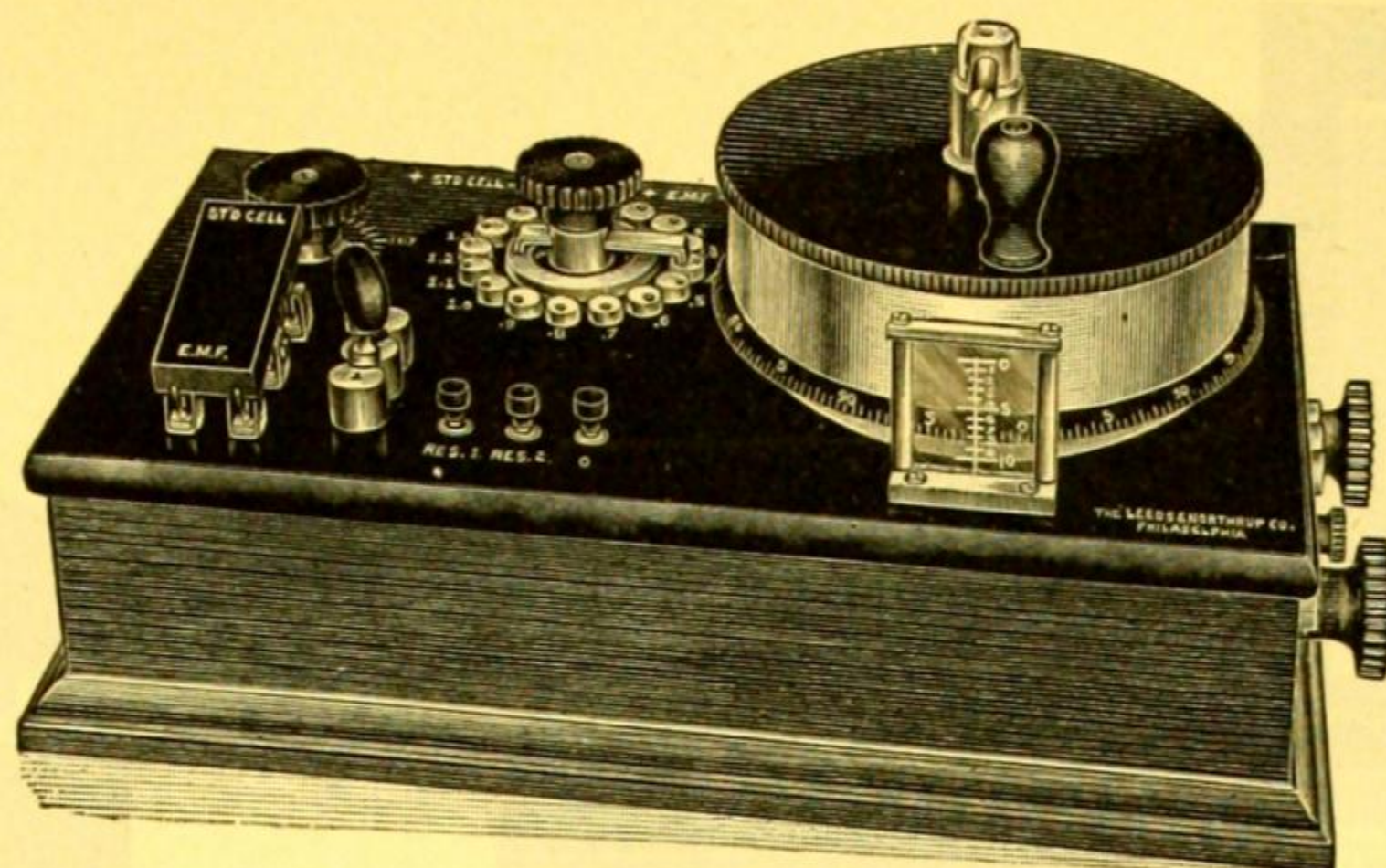
The field rheostat will reduce the voltage of any set to 25 per cent of its normal rating, but the charging rate used must not exceed the ampere rating marked on the generator name-plate.

These outfits are shipped completely assembled with all wiring done except connecting the motor to the line and the generator to its circuit. All terminals are clearly marked to facilitate making these connections. The outfits will be found very simple to install and easy to operate. The motor of No. 4842 is supplied with two pairs of leads, one for use on 110, the other on 220 volts.

No.	B	D
Output, watts	250	500
Voltage of generator.....	24	24
Shipping weight, lbs.....	170	250
4842. MOTOR GENERATORS , with single phase, 60-cycle motor. For use on either 110 or 220 volts.....	140.00	170.00
4846. MOTOR GENERATORS , with 110 volt, D. C., shunt wound motor.....	130.00	155.00
4848. MOTOR GENERATORS , with 220 volt, D. C., shunt wound motor.....	130.00	155.00

OVENS, see general heading **Ovens**.

PHYSICAL CHEMISTRY APPARATUS, see general heading **Physical Chemistry Apparatus**.



No. 4856 (Shown without Cover).

POTENTIOMETERS

4856. **POTENTIOMETER, L & N, Type K.** For measurements of potential differences in which the utmost obtainable accuracy and precision are desired, this potentiometer is the best that can be bought. Because of the numerous occasions for accurate measurement of potential differences in many different kinds of investigation, the value of the instrument to the user is much increased, since it has an exceptionally wide range which makes it suited to measurement of both low potential differences such as those of thermocouples, and, without accessories, of all potential differences up to 16 volts. In the laboratory of physical chemistry it is especially satisfactory for the measurement of electrode potentials and temperatures. The accuracy with which electromotive force can be measured ranges from .02% to .1%, the latter figure applying to measurements of very small potential differences.

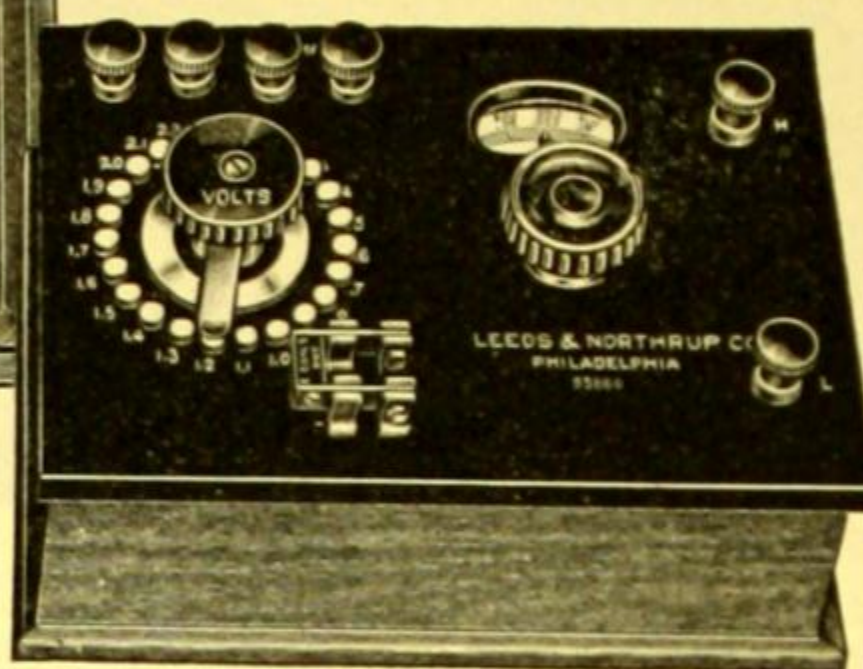
The measuring circuit of the instrument consists of 15 coils of 5 ohms each, adjusted to .01% accuracy, connected in series with a slide wire. The potential difference to be measured is applied through a suitable galvanometer (see No. F4460) to a contact brush bearing on a series of studs, through which connection is made between the coils above mentioned and a contact which can be moved to any point on the extended slide wire. When the current through the measuring circuit has been properly adjusted and the sliding contacts so placed that the galvanometer shows no deflection, the potential difference being measured has the value indicated by the settings of the movable contacts. To facilitate adjustment, three tapping keys are provided by means of which resistance may be introduced into the galvanometer circuit without disturbing the settings of the contacts. An auxiliary dial should be set to the certified value of the standard cell voltage. An ingenious arrangement of circuits permits changing the range of the instrument to one-tenth its normal range merely by shifting a plug. As a working battery, a single lead storage cell (see No. 1042) or two No. 6 dry cells in series (see No. 964) or two Edison cells in series (see No. 1048) may be used.

The case of the Type K Potentiometer and its dust-proof cover are of polished mahogany. The top of the instrument on which the various parts are assembled is a thick plate of highly polished ebonite. The extended slide wire is wound on a molded cylinder and the contact which bears on the slide wire is mounted inside a cylindrical housing of bakelite which serves at the same time as a shield against the accumulation of dirt on the slide wire.

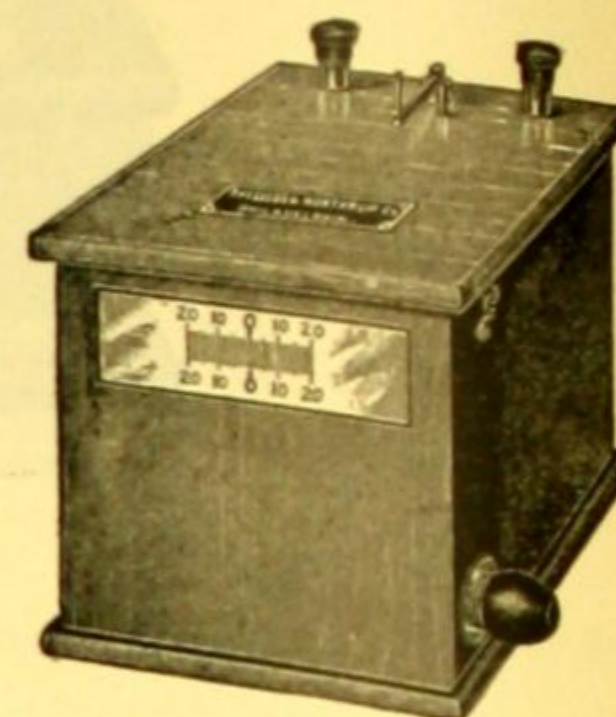
When the Type K Potentiometer is used with a sensitive galvanometer for the measurements of hydrogen electrode potentials, the attainable precision is so great that, unless the most extreme precautions are observed in control of temperature, pressure, and purity and strength of solutions, the information given by the readings will be very little better than that obtained with less refined apparatus.

The investigator who takes pride in the excellence of the instruments comprising his equipment will feel that his laboratory is not complete without a Type K Potentiometer.

Complete as described, with regulating rheostat incorporated in the same case, with complete directions for use..... \$275.00



No. 4860.



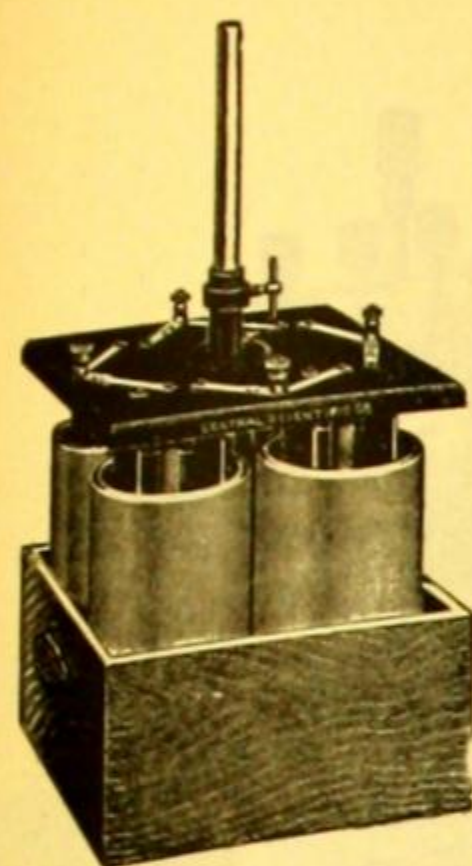
No. F4460.

4860. **POTENTIOMETER, L & N, Students'.** This is an instrument especially designed for use in the students' laboratory, but is useful also for everyday potential measurements. In order to avoid making the instrument expensive but at the same time to embody in it the highest quality attainable, the manufacturers have omitted such refinements as contributed only to convenience but which had no bearing on accuracy of measurement. As a result this instrument is much simplified in construction as compared with the Type K Potentiometer (see No. 4856). In an instrument intended for students' use, this simplification has the advantage that it makes necessary on the part of the student a clear understanding of the circuits which adds much to its educational value. With the students' potentiometer measurements may be made of potential differences up to 2.3 volts. There are 22 steps of .1 volt each and a slide wire having a total range of .1 volt on which a continuous variation of potential may be made. The calibration of the slide wire is guaranteed to be within one-half per cent. of its range, i. e., to .0005 volt. This figure represents the numerical probable accuracy of any reading. The 22 coils are adjusted to equality within one-twenty-fifth per cent. Binding posts are provided which permit a connection to the slide wire only through a pair of end coils each of which has 4.5 times the resistance of slide wire. These extension coils may be short circuited by means of a switch provided on the instrument as shown in the illustration. In this manner it becomes possible to use the slide wire as the variable ratio in a Kohlrausch bridge for the measurement of electrolytic resistance. This feature makes it a double-purpose instrument and therefore especially valuable in a students' laboratory of physical chemistry. Each instrument is accompanied by a direction card secured in the cover, showing connections both for measurement of potentials and for resistance measurements.

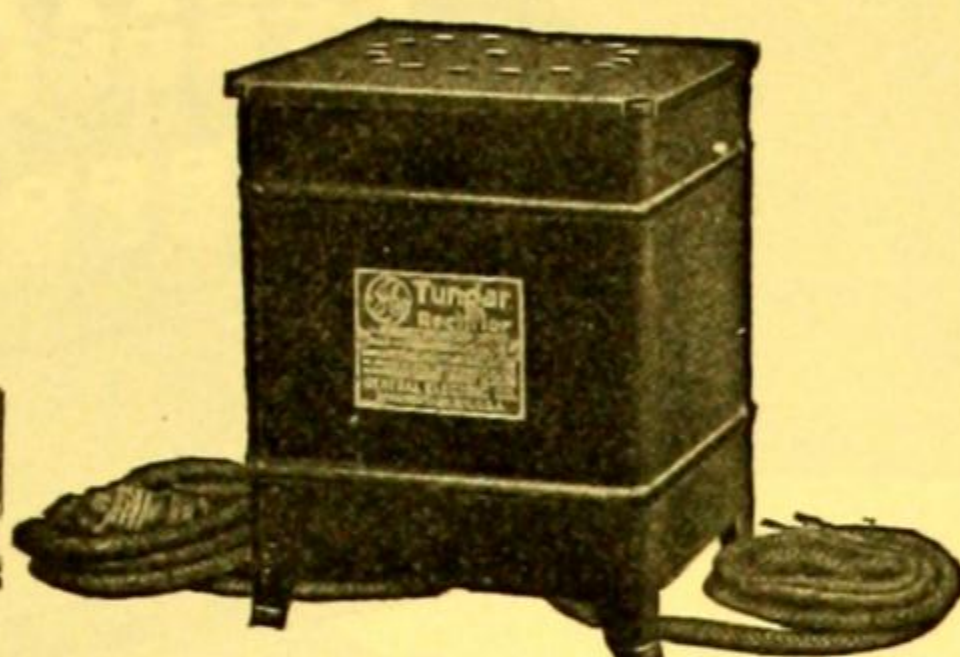
A polished mahogany case and cover are provided. The electrical parts are all mounted on a highly polished ebonite plate and the workmanship and finish are of the best throughout \$90.00

Note:—When No. 4860 is used in a Kohlrausch bridge, No. 4743A is the proper resistance box to use in connection with the slide wire.

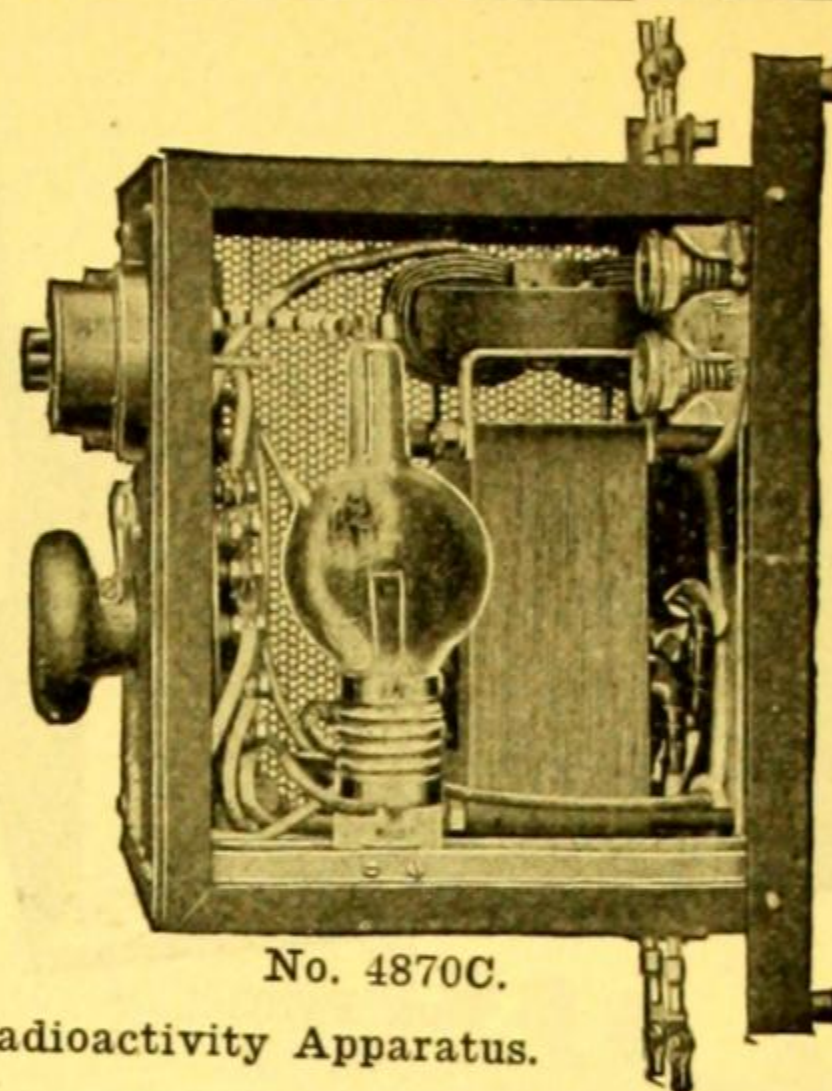
F4460. **GALVANOMETER, L & N, Combined with Lamp and Scale,** especially suitable for use with the Type K Potentiometer for measurements with the hydrogen electrode. This is a single unit instrument which combines a moving coil galvanometer and a mirror attached to its coil with the necessary lamp and scale to indicate the deflection of the coil. Because of its construction by which a beam of light is employed in place of the usual pointer in a portable instrument, much greater sensitivity is secured in a resilient mounting. The result is that great stability is obtained without the sacrifice of sensitivity. The combination instrument may therefore be set up without the painstaking leveling required in instruments of the usual form in which the coil hangs from an upper support but is not held in position by means of a taut lower suspension. This galvanometer has a resistance of 1000 ohms which makes it especially suitable for gas chain measurements. It has a period of 3 seconds for a complete vibration, and its sensitivity is 2 mm (on its own scale) per microampere..... 55.00



No. 4866.



No. 4870A-B.



No. 4870C.

RADIOACTIVITY APPARATUS, see general heading **Radioactivity Apparatus**.

RECTIFIERS

4866. **RECTIFIER, Electrolytic, or Nodon Valve.** Consists of four cells with electrodes of lead and aluminum, and depends for its action on the fact that an electric current will not enter the electrolyte from the aluminum electrode, but will pass freely into the electrolyte from the lead. The electrodes are fastened to a substantial non-conducting top, with binding posts for both A. C. and D. C. circuits. The connections are made by straps of metal, so that the path of the current is readily traced.

This valve, though not as satisfactory as a Motor Generator, may be used on either 110 or 220-volt alternating circuit with a moderately high efficiency. Currents of from 5 to 8 amperes may be obtained for laboratory use, and for short periods of time, much larger currents may be drawn from the valve. Complete with chemicals, glass jars, and full directions..... \$25.00

4867. **CHEMICALS** for No. 4866, per complete charge50

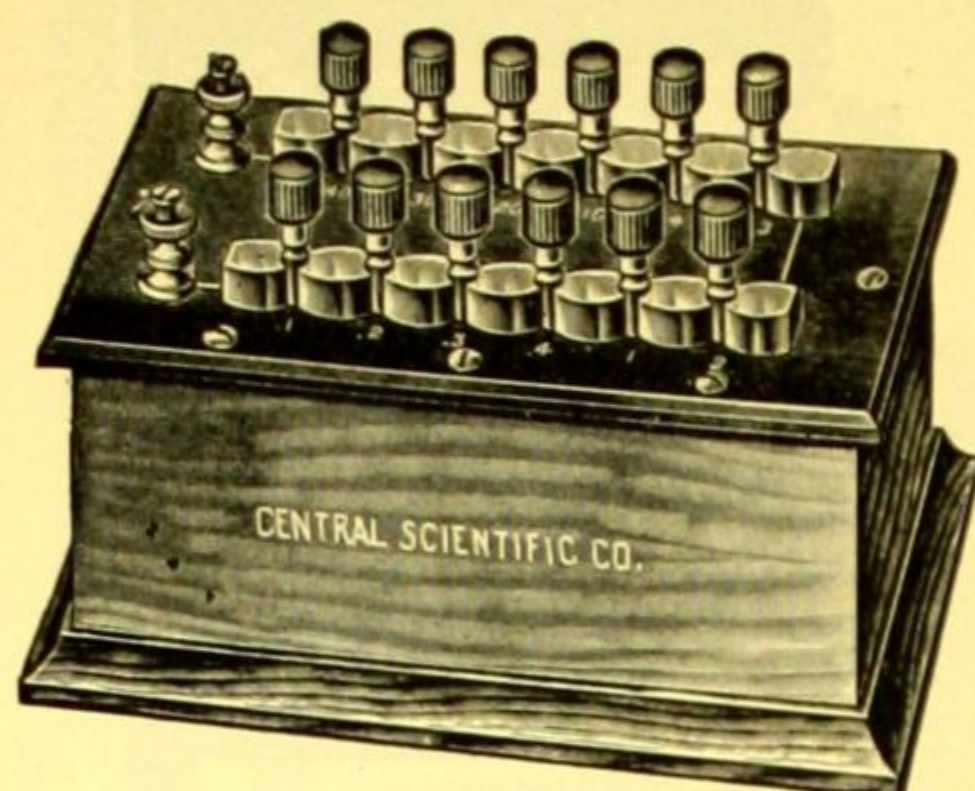
4868. **GLASS JAR** for No. 4866, for replacements..... .75

4870. **RECTIFIERS, Tungar.** These rectifiers consist of a bulb filled with an inert gas at low pressure and having for cathode a filament of small tungsten wire coiled into a closely wound spiral and for anode a piece of graphite of relatively large cross section. The tungsten filament is heated to incandescence by being placed in the secondary circuit of a transformer, which is part of the outfit. This incandescent filament, as is well known, emits electrons and ionizes the rarified gas in the bulb, which thus becomes a conductor of electricity. In addition to being in the secondary circuit of the transformer, the tungsten filament is connected to one terminal of the A. C. line and the graphite electrode to the other terminal. During the half-cycle in which the filament is negative, the electrons being themselves negative are driven from the filament and across to the graphite positive electrode, ionizing the gas molecules as mentioned above and permitting the passage of a current. During the other half of the cycle when the filament is positive, if any electrons are emitted, they are immediately attracted to the filament again, so that the gas remains non-conducting. Since the direction of a current is opposite to the direction in which the negative electrons travel, it is evident that the current passes during each alternate half-cycle from the graphite electrode to the tungsten filament through the bulb. We therefore have in the circuit of the bulb a pulsating unidirectional current.

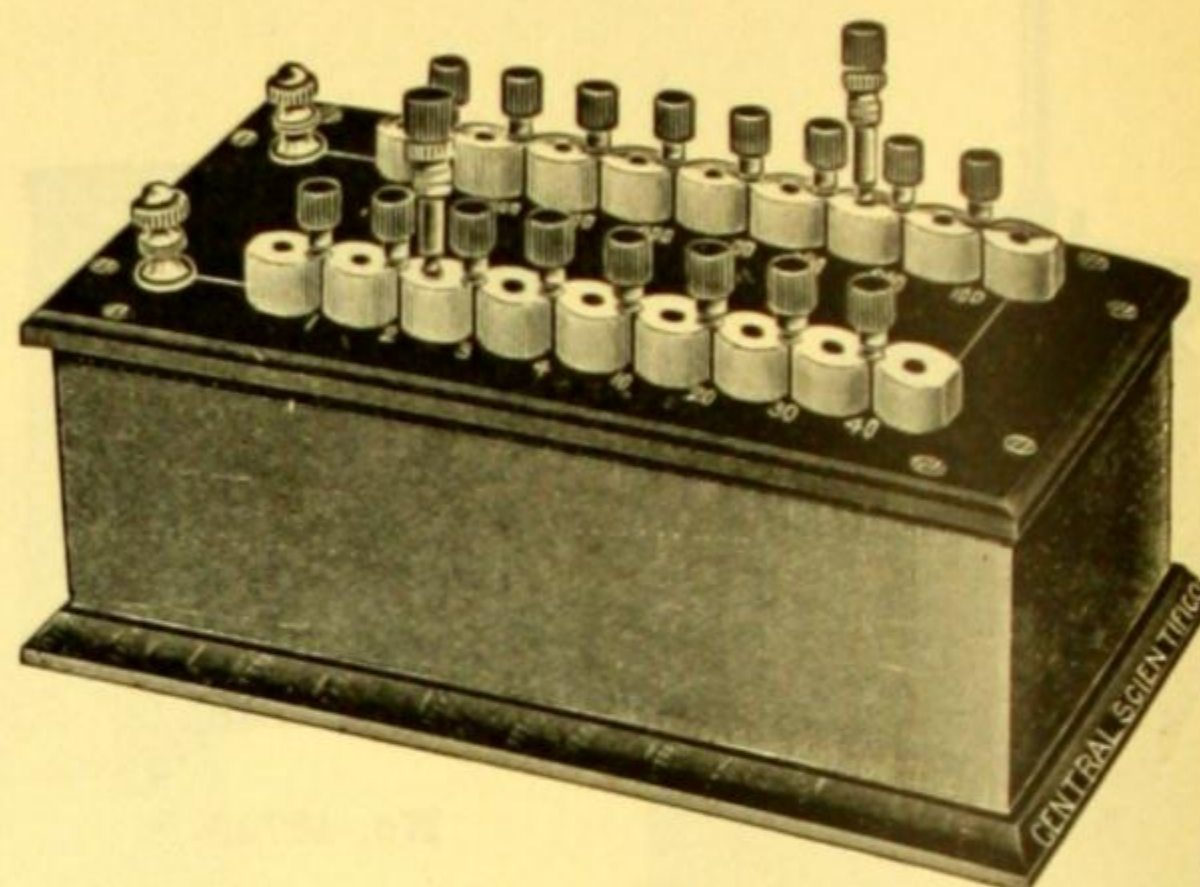
This current is especially adapted to battery charging but may be used for many other purposes such as in electrolytic experiments, electro-plating, for running small motors, etc.

Tungar Rectifiers are designed for 115 volt, 60-cycle circuit, but may be used on from 105 to 125 volt circuit. They are mounted in a black japanned casing, with a perforated top. This casing contains the bulb, the transformer and a fuse to protect against overloads. These rectifiers are especially superior to many rectifiers on the market in that they operate satisfactorily when only a fraction of their full output is being used. Nos. A and B are provided with legs for placing on floor or table; No. C is intended for wall installation, and is provided with ammeter. Furnished with cord and plug for attachment to any incandescent lamp socket.

No.	A	B	C
Output, full load, watts.....	15	37½-45	450
Amperes, full load.....	2	3-5	6
Volts, full load.....	7.5	7½-15	75
Height, inches	8¼	10	14
Depth, inches	5⅞	8	12⅜
Width, inches	6¼	6¼	10⅞
Shipping weight, lbs.....	12	24	81
Each	18.00	28.00	130.00
4871. Tungar Bulb only, renewal.....	4.00	8.00	8.00



Nos. F4703-5.



Nos. F4711-13.

RESISTANCE BOXES AND WHEATSTONE BRIDGES

In the construction of our resistance boxes we use high grade rubber plates for the tops, of sufficient thickness to insure a firm anchorage for the brass bars, and the best obtainable wire.

All coils are wound bifilar in uniform layers and are practically free from inductance and capacity so that any of the boxes may be used in conductivity experiments with alternating currents. The coils are securely fastened to the top, so that there is no danger of the spools breaking loose and destroying the connections.

Our plugs are provided with knurled hard rubber tops moulded on, which prevents removal. The plugs are carefully fitted, giving good contacts, and are placed sufficiently far apart to insure easy manipulation. The brass blocks are heavy and separated so that the insulation between may be cleaned.

We guarantee, without reservation, all our boxes to be accurate within the per cent. claimed, and any boxes will be replaced that show faulty construction or do not come up to the guaranteed accuracy when compared with reliable standards.

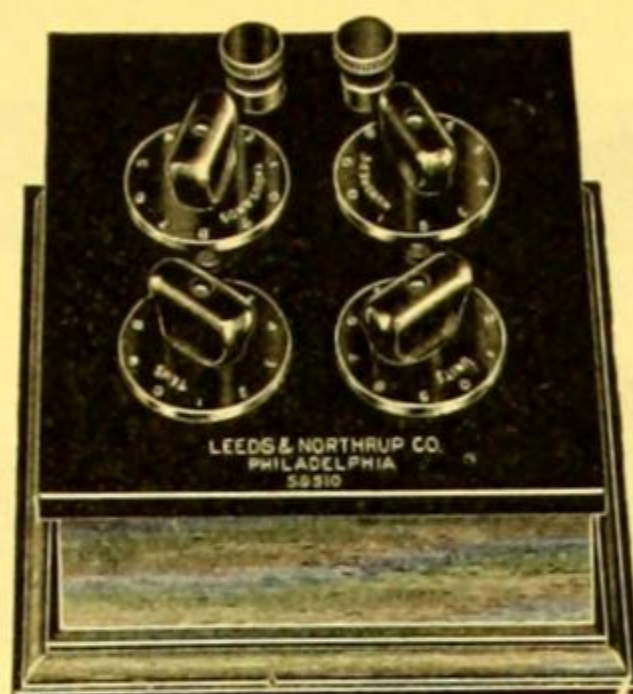
F4703. RESISTANCE BOX, Standard Design, for individual student use. We believe this box will be found to be superior to any sold at an equal price. The total resistance is 111 ohms, divided as follows: 0.1, 0.2, 0.3, 0.4, 1, 2, 3, 4, 10, 20, 30 and 40 ohms. The coils are guaranteed accurate to $\frac{1}{2}$ of 1%. For detailed description of construction, see above..... \$16.75

F4704. RESISTANCE BOX, same as No. F4703, but with guaranteed accuracy, $\frac{1}{5}\%$ 19.00

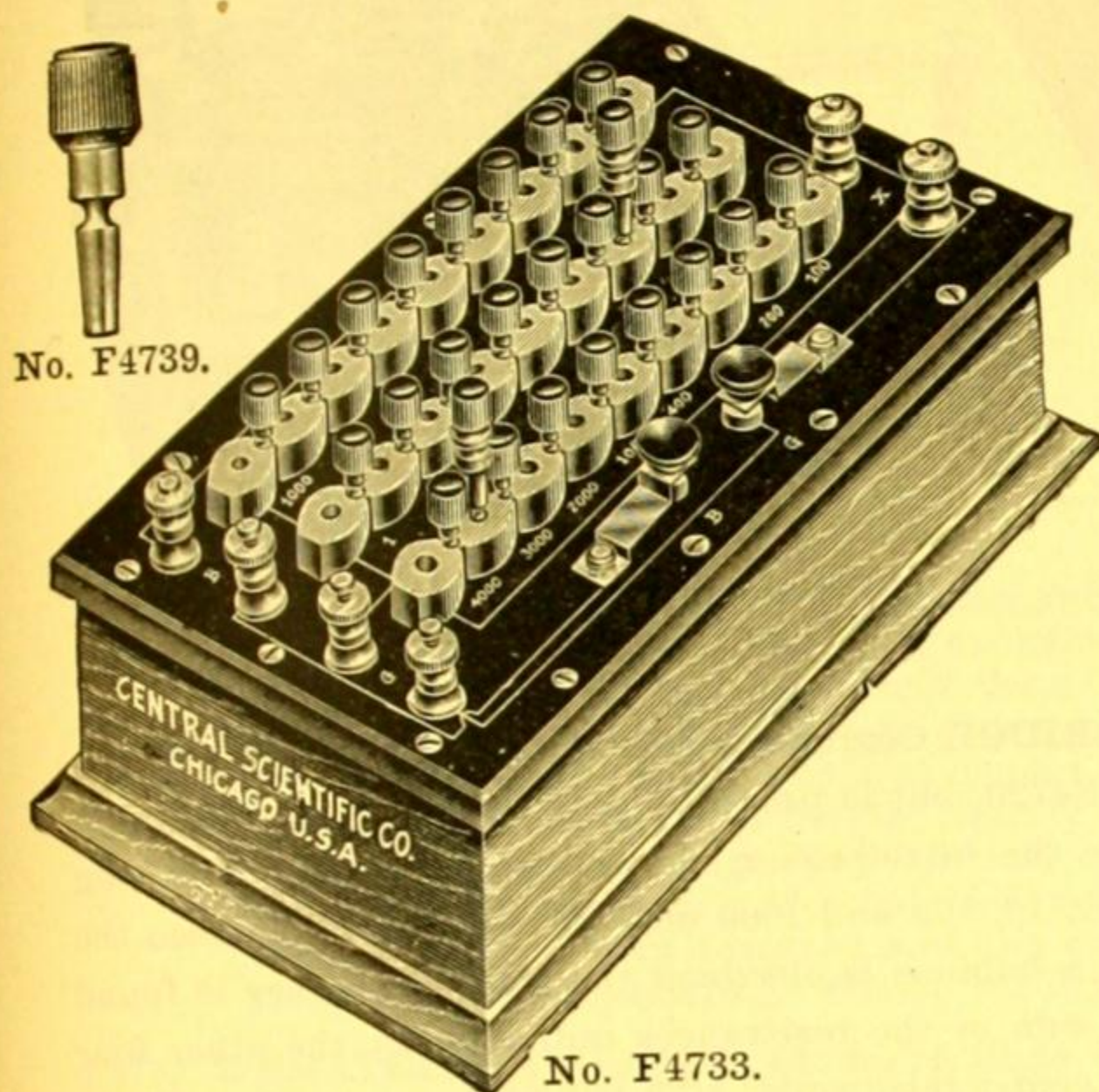
F4705. RESISTANCE BOX, same as No. 4703, but with total resistance of 1,111 ohms, divided as follows: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400 ohms. Guaranteed accuracy, $\frac{1}{5}\%$ 20.00

F4711. RESISTANCE BOX, Standard Design, with traveling plugs. The blocks are of new and improved form, which enables the coils to be held more firmly in position, and lessens the danger of imperfect contact between coils and blocks. The traveling plugs add greatly to the usefulness of the instrument, making it available for the comparison of the E. M. F. of batteries and other tests by the potentiometer method. The total resistance is 1,111 ohms, as follows: 0.1, 0.2, 0.3, 0.4, 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300 and 400. For detailed description of construction see above. Guaranteed accuracy, $\frac{1}{5}\%$ 55.00

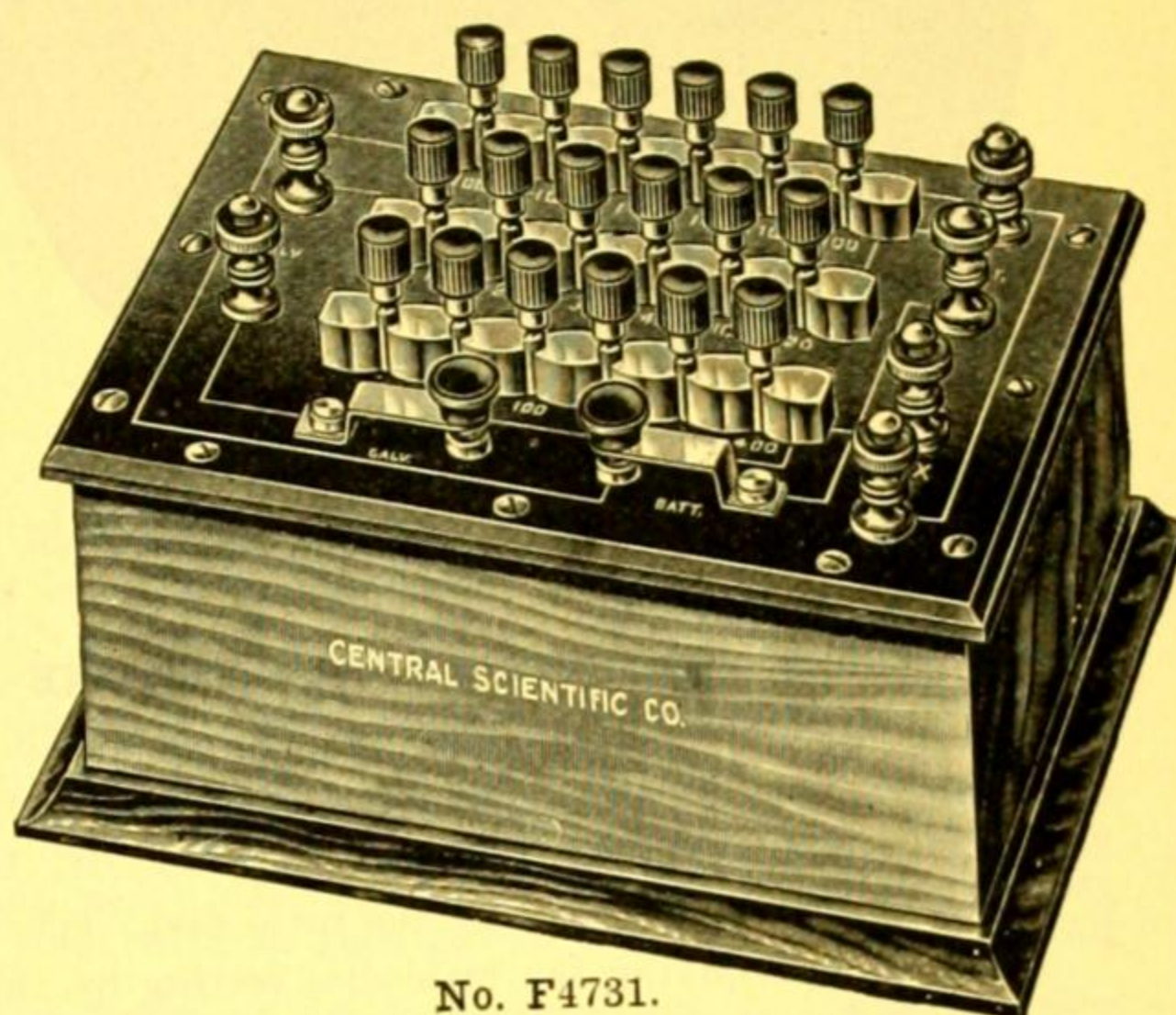
F4713. RESISTANCE BOX, same as No. F4711, but with total resistance 11,110 ohms, as follows: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000 and 4000..... 57.00



No. F4720.



No. F4739.



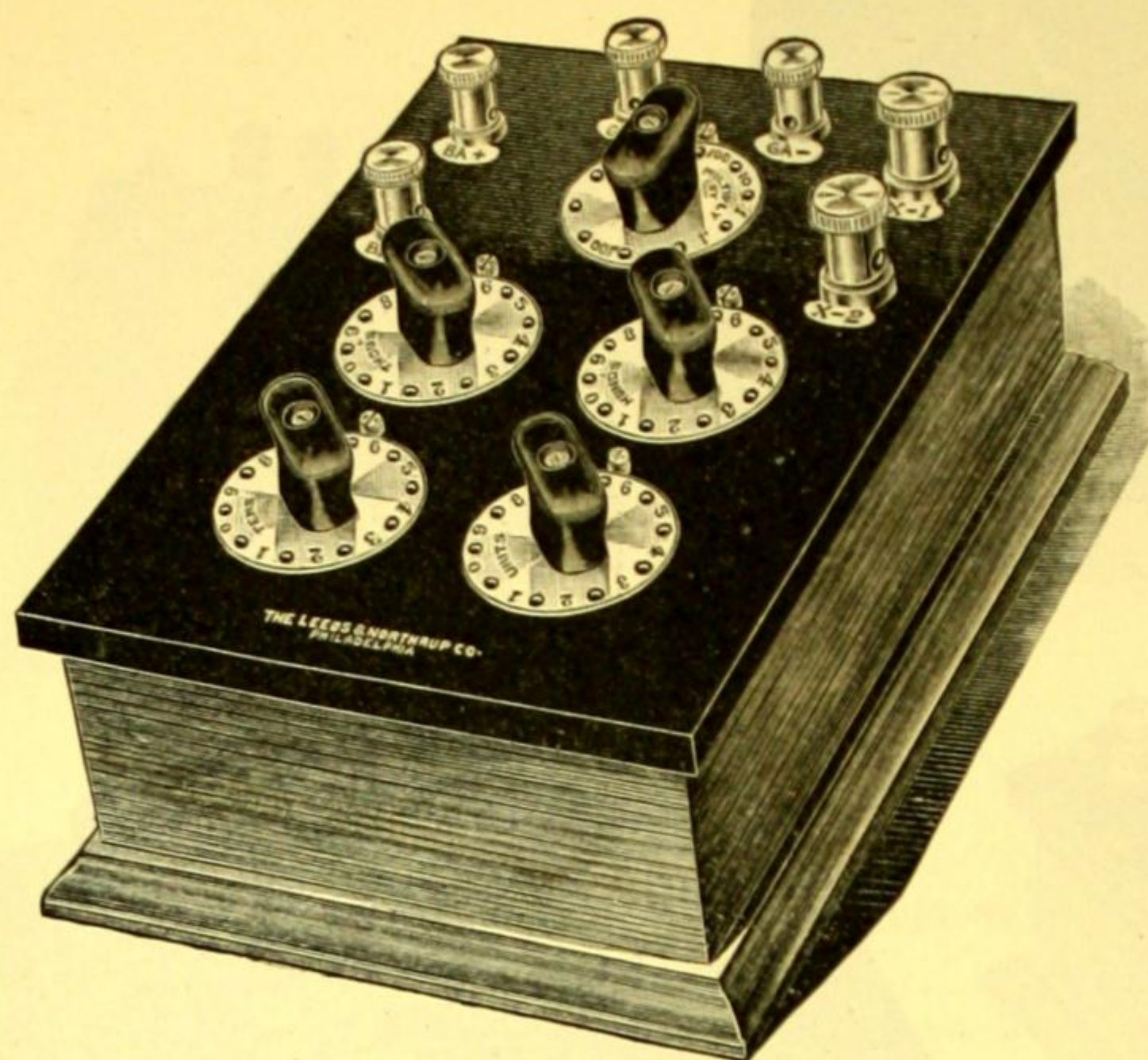
No. F4731.

F4720. RESISTANCE BOX, L. & N., Dial Decade Type. In this box there are five coils to each decade, consisting of one coil of unit resistance (1, 10, 100 and 1000) and four coils of two units resistance each (2, 20, 200 and 2000), so arranged that any resistance from one to nine units is introduced consecutively into the circuit by turning the indicating handle to the successive positions of the dial. The coils in each decade have ten times the resistance of those in the preceding one, and the total resistance is the sum of the resistances in each decade circuit. In this manner resistances of from 1 ohm to 9,999 ohms by 1 ohm variations may be obtained. The contacts are beneath the top plate where they are protected quickly and accurately. Multiple leaf brushes attached to the rotating handle bear upon the contact studs, each leaf making independent contact. The brush ends are bent down at such an angle as not to wear grooves in the studs. A click indicates the proper setting of the handle for each position. The resistances are wound bifilar upon wooden spools to eliminate any inductive effect, and are accurate to 1/10 per cent. With four dials, having total resistance of 9, 90, 900 and 9000 ohms. \$50.00

F4731. RESISTANCE BOX and WHEATSTONE BRIDGE Combined. Polished hardwood mahogany finished box with hard rubber top $\frac{3}{8}$ -inch thick. Heavy brass blocks of new design (see No. F4711) are used. For other details of construction, see page 206. The bridge coils are six in number, 1, 10 and 100 ohms on each side. The rheostat coils are twelve in number, viz: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400 ohms. The total range of measurement is therefore from 0.01 to 111,000 ohms. The binding posts for battery, galvanometer, and unknown, and keys with platinum contacts for battery and galvanometer are conveniently placed, and all hidden connections are clearly indicated by lines on the top of the box. Guaranteed accuracy, 1/5% 52.00

F4733. RESISTANCE BOX and WHEATSTONE BRIDGE Combined. An exceptionally high grade box of the finest materials and first class workmanship. The blocks are of new and improved design (see No. F4711), and the other details of construction are as described on page 206. The rheostat coils are sixteen in number, viz: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000 ohms. The bridge coils are eight in number, 1, 10, 100 and 1000 ohms on each side. The total range of measurement is therefore from 0.001 to 11,110,000 ohms. The binding posts for battery, galvanometer, and unknown, and keys with platinum contacts for battery and galvanometer are conveniently placed, and all hidden connections are clearly indicated by lines on the top of the box. Has two traveling plugs. Guaranteed accuracy, 1/10% 80.00

F4739. BRASS PLUG, with knurled rubber top, as used on our Resistance Boxes.25



No. F4743A.



No. F4750.

F4743A. RESISTANCE BOX and WHEATSTONE BRIDGE Combined, L & N Dial Form. This box is of the same design and construction as No. F4720, but is provided with five dials, one of which controls the ratio coils, the others serving for the introduction of resistance in steps of 1 ohm from 1 to 9999 ohms. Ratios of .001, .01, .1, 1, 10, 100 and 1000 may be established between the two arms by means of the ratio dial. When a balance is obtained the total resistance is found by multiplying the ratio dial setting by the sum of the resistances indicated by the other four dials. Accuracy of rheostat coils, 1/10 per cent.; ratio coils, 1/20 per cent. \$70.00

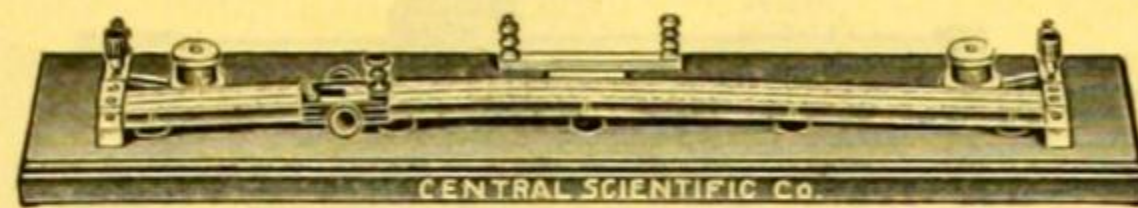
F4750. TESTING SET, L. & N., Portable, a complete self-contained outfit for resistance measurements. The instrument consists of a five-dial Wheatstone bridge of the type described under No. F4743A, mounted in the same case with a dry battery and a rugged galvanometer of the pointer type with suspended coil system. By means of switches conveniently located, the internal connections may be quickly changed for different types of measurement. By the use of an additional switch the contained battery may be disconnected and an external battery used. A hinged cover, in which is contained a wiring diagram with directions for operating, may be locked shut to protect the working parts. A strap handle is provided for carrying. Many uses will be found for such a set. The range covered by the coil resistances (1 to 9,999 ohms by 1 ohm) and ratio arms (.001 to 1000 in multiples of 10) enable the Testing Set to be used for any purpose from the accurate measurement of small laboratory resistance to the measurement of insulation resistances up to a few megohms. It may be also used in locating faults in telephone circuits by the Murray or Varley loop method, and for locating "opens", by the addition of a buzzer and telephone receiver.

The resistance coils are guaranteed to an accuracy of 1/10 per cent. The galvanometer has a coil resistance of only 200 ohms, and is sensitive to 1 megohm. In case of breakage of suspension, the movable system is easily removed for repairs.

Dimensions of case, $8\frac{1}{2} \times 7\frac{3}{8} \times 4\frac{1}{2}$ inches; weight, 8 pounds. Complete with booklet of information and directions for use. 100.00

F4752. Extra Battery for No. F4750.75

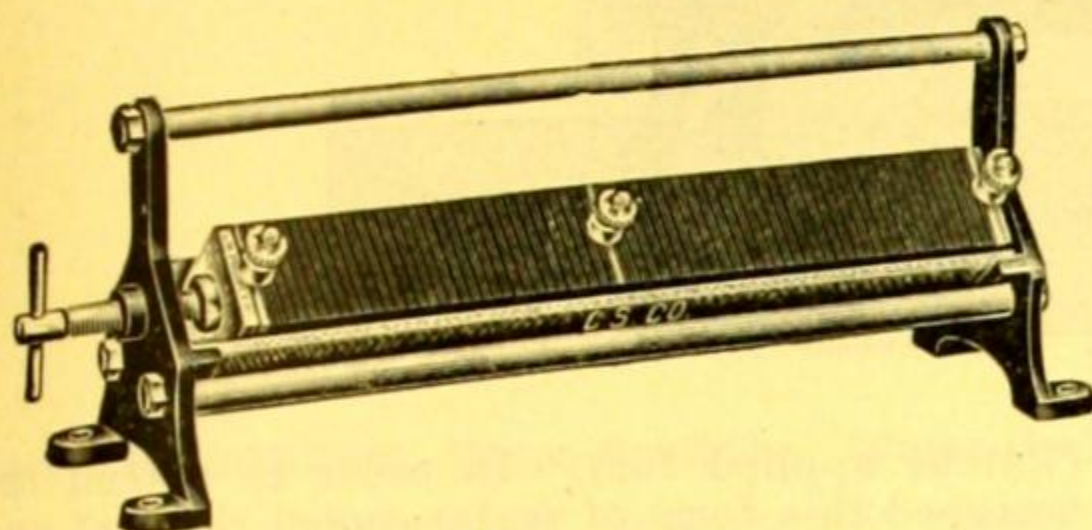
For Buzzer and Telephone Receiver, see Physical Chemistry Apparatus.



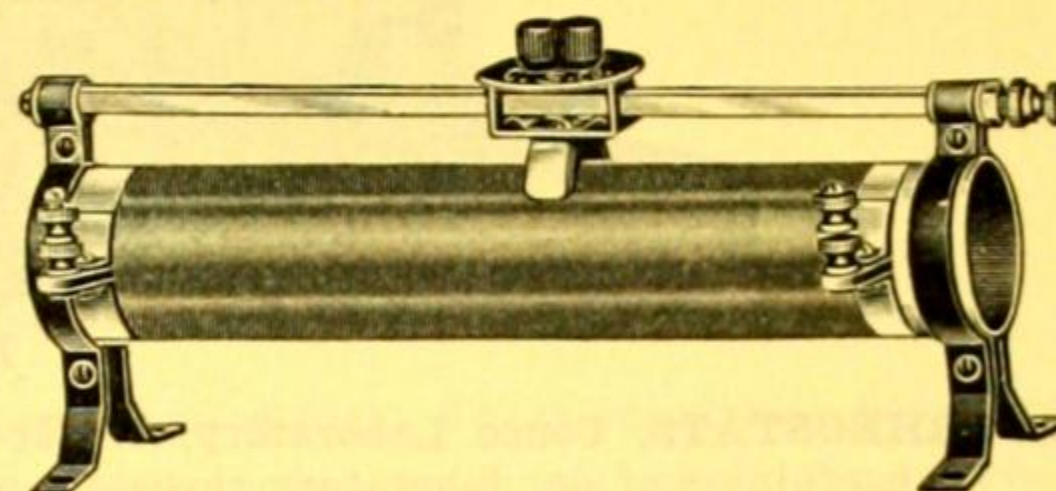
No. 10436.



No. F4763.



No. 4960.



No. 4967.

10436. **WHEATSTONE BRIDGE for Conductivity Measurements, Extended Coil Type**, as developed at the University of Illinois. The bridge is of the usual slide wire form with a half-meter scale graduated on the upper half from 475 to 525 cm and on the lower half from 0 to 50 cm in 0.1 cm divisions. A wire of very low thermal coefficient but of high resistance is stretched over the scale, and a sufficient amount is wound on two spools, placed at the ends, to make 1000 cm of total length, exactly divided as to resistance. By means of removable plug contacts, the bridge may be used either as a half-meter or as a ten-meter bridge. In this way the resistance of a solution may be approximately determined on the half-meter scale, the plugs then removed and the exact point determined on the ten-meter scale. By using this bridge, readings can be readily made with an accuracy of 0.01 of 1 per cent. \$40.00

F4763. **WHEATSTONE BRIDGE, Standard Slide Wire Form**, of simple construction. A resistance wire one meter long is mounted on a scale graduated in millimeters, and provided with a sliding knife edge contact. The strips are of brass with no soldered joints and provided with a single gap in each of two arms of the bridge for known and unknown resistance. Complete with necessary binding posts and full directions, on finely finished hardwood board, 12.5x110 cm. 6.00

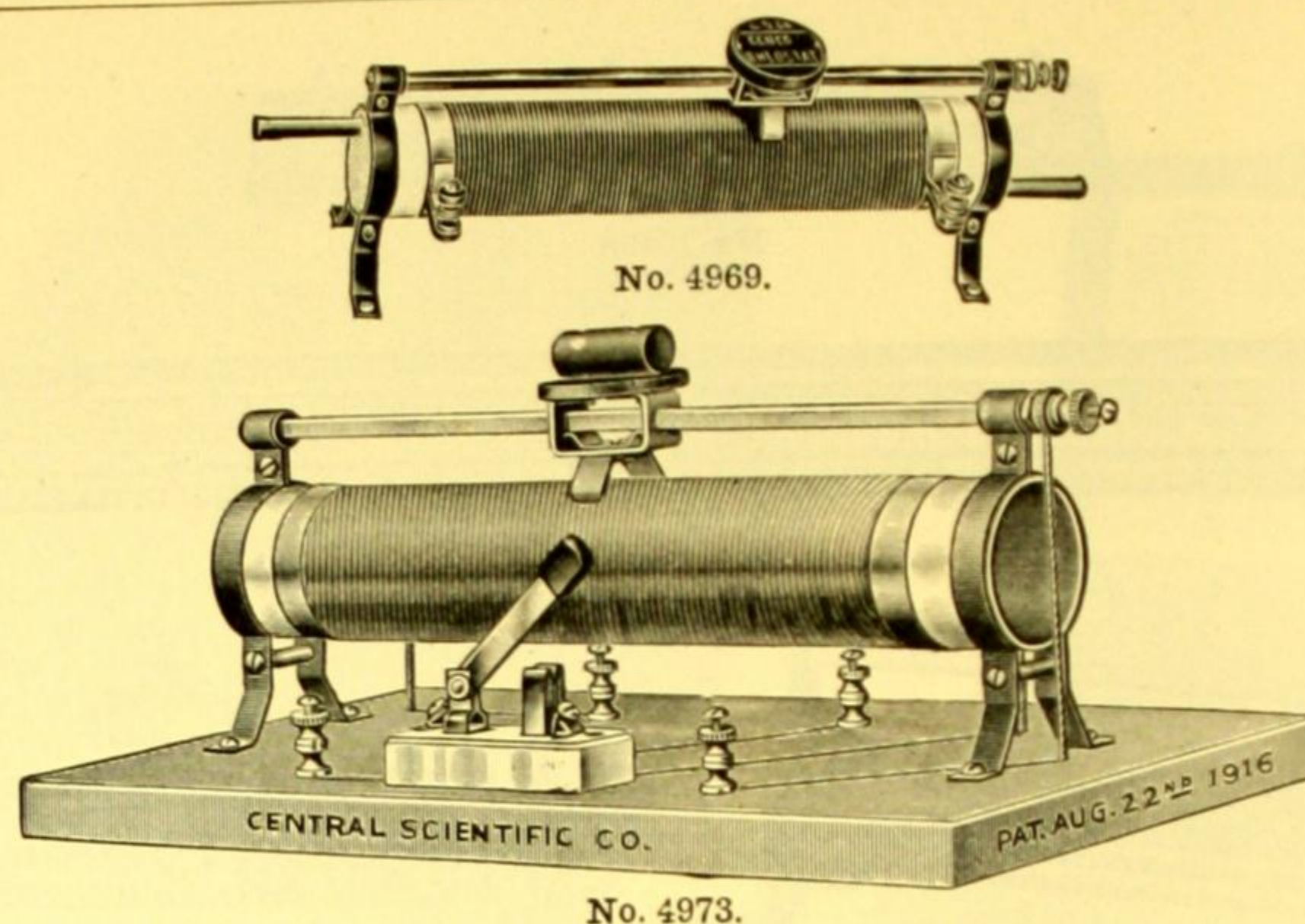
For other **WHEATSTONE BRIDGES**, see general heading, **Physical Chemistry Apparatus**.

4960. **RHEOSTAT, Carbon**, for use in battery testing, calibrating electrical instruments, photometry, and any experiments in which a **UNIFORM VARIATION** of resistance is desired. Consists of 90 carbon plates $1\frac{1}{2}$ inches square and $\frac{1}{8}$ inch thick, mounted between castings in a trough of asbestos slate so that pressure can be placed on them by a screw, thus allowing a range of resistance of from about 0.1 ohm to 8 ohms or more, including all intermediate values. Safe load for constant duty, 200 watts. A momentary overload of from 500 to 1000 watts may be applied without danger of injury. 15.00

4967. **RHEOSTATS, Cenco Laboratory, Air-cooled**. After a thorough experimental investigation, we have standardized on the rheostats described and listed below as representing the minimum assortment which is likely to cover all the requirements that may arise for a rheostat in any laboratory. By standardizing on a single length of tube, we are able to produce these rheostats in such quantities as will permit unusually low selling price without a sacrifice of quality. These rheostats are designed for a dissipation of 425 watts continuously, and where they are used for brief intervals, they may be overloaded 25% without danger. The dissipation above mentioned refers to the entire length of the tube. The current or resistance ratings mentioned in the table below will be correct to within 5%.

These rheostats are substantially constructed of white porcelain-enameled steel tubing wound with oxidized wire of negligible temperature co-efficient and provided with the usual form of sliding contact for adjustment of resistance. They may be used either in series with the load or as a potential divider. In ordering please specify catalog number and letter referring to the desired ranges.

4967.	No.	A	B	C	D	E	F	G	H	K	L	M
	Approx. resistance, ohms...	2870	1435	715	357	177	89	44	22	11	5.6	2.8
	Max. cur. capacity, amps..	.38	.54	.77	1.1	1.5	2.2	3.1	4.4	6.2	8.7	12.3
	Each	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.25	6.50	7.00	7.50



No. 4969.

No. 4973.

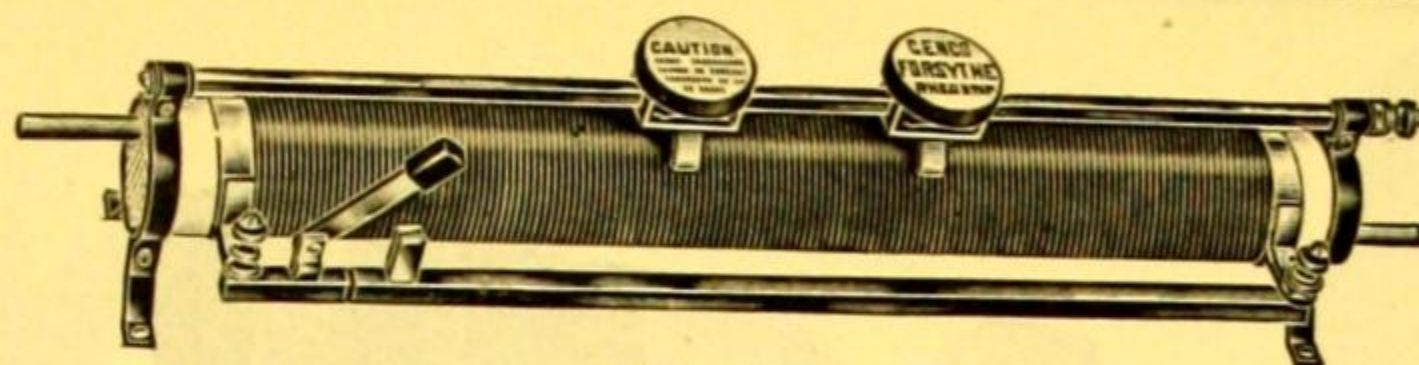
4969. **RHEOSTATS, Cenco Laboratory, Water-Cooled** (Patent applied for). In order to extend the usefulness of our laboratory rheostats we have designed this form of water-cooled rheostat and have applied the principle to the five sizes of our air-cooled rheostats rated for the largest currents. The design is based upon careful experimental work, and the water-cooled rheostats, when supplied with tap water at the rate of approximately 1 liter per minute, will be capable of absorbing four times as much heat as the equivalent air-cooled rheostats. In this manner, the current capacity of the rheostat is doubled and the heat dissipation of the 12-inch tubes becomes 1.75 k. w. In laboratories having a water supply available, we highly recommend this form for exact control of current in experiments where the requirements exceed those which are met by the air-cooled form of rheostat. When these rheostats are used without water cooling, the maximum current should not exceed 40 per cent of the rated value. The water-cooled rheostats are provided with tubulations as shown in the illustration, welded into steel plates which in turn are welded to the ends of the rheostat tubes. The entire unit is white enameled and the inside of the tube is covered with a protective coating to guard against rusting. Incidentally, sizes A and B are useful as laboratory water heaters, the A size being attached to a 220 volt circuit and the B size to a 110 volt circuit. By connecting the entire rheostat across the line and adjusting the flow of water for a definite rate, the temperature of the outflowing water will be remarkably constant so that it may be used for maintaining constant temperature in connection with refractometers, polarimeters and other apparatus. No. 4969A rheostat is also useful as an air heater on a 110 volt circuit, while two of these rheostats in series will accomplish the same purpose on a 220 volt circuit. These applications of rheostats make them extremely useful devices in the laboratory for drying of glassware and other purposes calling for a current of heated air.

No.	A	B	C	D	E
Approximate resistance, ohms.....	44	22	11	5.6	2.8
Maximum current capacity, amperes.....	6.2	8.8	12.4	17.4	25
Each	\$9.00	9.25	9.50	10.00	10.50

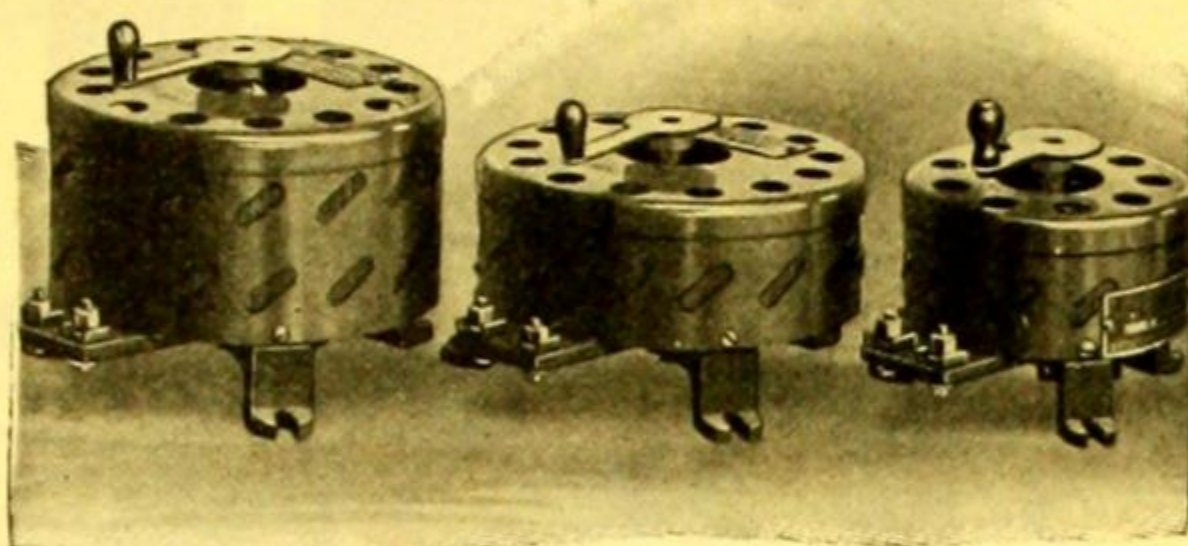
4973. **RHEOSTATS, Dodge Design**, providing a system of wiring whereby a Cenco Rheostat may be connected either in series with the load or as a shunt across the line, the change being made simply by closing a single-throw switch. By means of the slider, the resistance may be varied from zero to the maximum of the rheostat. When connected in series with the load, this variation of the resistances produces a variation in the voltage across the load, the minimum of which is limited by the ratio of the load resistance to the total resistance of the circuit. The current through the load is varied in the same proportion. By this connection it is impossible to obtain very small currents and voltages. By closing the switch and thereby shunting the rheostat across the line, a potentiometer effect is secured by means of which the voltage and current may be varied from zero to a maximum amount, which is the same as the minimum of the series connection. In this manner one secures the full value of the rheostat and in a simple fashion can run the entire range of voltage and current. Current rating is for continuous service with moderate temperature rise. Overloads of 50 per cent. and more are permissible on intermittent service.

The rheostats are mounted upon a base of asbestos slate (transite), provided with binding posts for connection to line and load, and with single-pole single-throw switch. All connections are plainly indicated on the base, and the rating in ohms and amperes is stamped upon the slider.

No.	A	B	C	D
For maximum volts.....	40	110	110	220
Approximate resistance, ohms.....	11	44	89	177
Maximum current carrying capacity, amperes	6.2	3.1	2.2	1.5
Each	12.50	12.50	12.50	12.50



No. 4982.



No. 4990F.

Nos. 4990B-D.

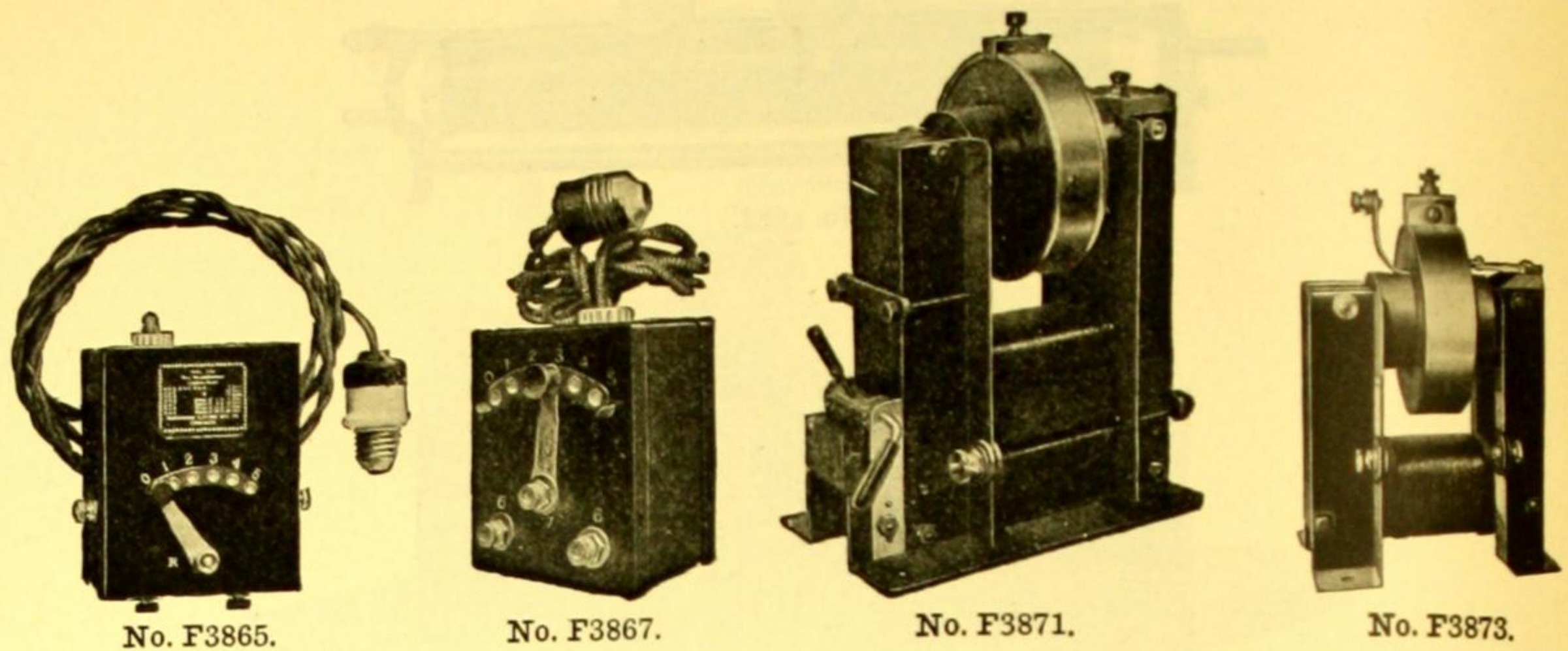
No. 4990A.

4982. **RHEOSTAT, Cenco-Forsythe, Water-Cooled** (Patent applied for). There has always been a need for a rheostat of large current capacity which should remain small enough in dimensions to avoid its becoming unwieldy. The Cenco-Forsythe rheostat meets the requirements by a very ingenious method of connections suggested by Dr. W. E. Forsythe of Nela Research Laboratory. The limitation on the ordinary tube rheostat is the fact that the maximum current is usually carried when the sliding contact is near the end of the tube. The result is that only a few of the turns of resistance wire are in actual use. By the application of the Forsythe connections, both ends of the winding are employed in carrying current, and consequently it becomes possible in the same rheostat to carry twice the maximum rated current for a simple rheostat of the same dimensions. It is accomplished by a switching arrangement and two sliding contacts which causes the current to divide at the ends of the rheostat winding, part of it passing out through the one sliding contact and the other part through the second sliding contact. The use of two sliding contacts also permits very fine adjustment of the current, a feature not found in a simple rheostat with a heavy winding. By putting the rheostat winding on a 20-inch tube, which is water-cooled in the same manner as No. 4969 Rheostat, and providing means for making the Forsythe modification, it becomes possible with one of these rheostats to carry four times the current which the same winding on an air-cooled rheostat of the same dimensions would carry. In listing the rheostats, we have indicated the maximum resistance values of each kind both as a simple rheostat and as a Forsythe rheostat. Corresponding to these maximum resistance values are indicated maximum values of current which can be continuously carried.

No.	A	B	C
Approx. maximum resistance, ohms.....	20.2 & 5	10.1 & 2.5	5.1 & 1.25
Max. current capacity, amperes.....	10 & 20	15 & 30	20 & 40
Each	\$15.00	15.50	16.00

4990. **RHEOSTATS, National, tapered** (i. e., having the first step of greater current-carrying capacity than the others). These are inexpensive, variable rheostats for use in the laboratory where small current carrying capacities, comparatively small resistances and small wattage consumption are needed. (For rheostats of large resistance, high current capacity and maximum dissipation of energy, see Nos. 4967-4982.) A rolling contact insures long life to the resistance element.

No.	A	B	D	F
Maximum amperes, first step.....	1	2	4	6
Ampere capacity, with entire rheostat in circuit ..	0.5	1	2	3
Total resistance, ohms.....	80	40	20	13.3
No. of steps.....	228	250	252	140
Each	6.00	6.00	6.00	10.00



F3865. **TRANSFORMERS, Laboratory.** For use on 110 Volt A. C. Circuits to give alternating currents at from 2 to 28 volts, which will operate all classes of small electric apparatus (A. C. or D. C.), including induction coils, motors and small lamps.

These transformers are indestructible, being enclosed in a steel shell, and operate on 100 to 125 volts, 60 cycles. The windings are embedded in an insulating compound making them impervious to moisture and cementing the entire winding into one solid block.

They are equipped with a new voltage regulator, which eliminates the necessity of a rheostat for controlling the secondary voltages and permits of the voltage being varied in steps of two volts. Voltages 4, 6, 8, 10, 14 and 18 are obtained by connecting to binding posts on the transformer without the use of the voltage regulator, and any of these six different voltages can be used simultaneously.

Each transformer is furnished with plug and flexible attachment cord for connecting transformer to line circuit, as well as secondary terminals on the secondary side, and bears a name plate giving complete enumeration of the various voltages obtainable from it.

No.	B	C
Capacity, watts	100	150
Dimensions, inches	5x4x3 $\frac{3}{4}$	5 $\frac{1}{4}$ x5x4
Weight, lbs.	8	11
Each	\$6.00	7.50

F3867. **TRANSFORMER, Laboratory.** To meet the demand for a transformer of smaller capacity than those listed under No. F3865, there has been developed a transformer of the same general description but smaller and having a voltage regulator giving eleven different voltages in steps of 2 $\frac{1}{2}$ volts, starting at 2 $\frac{1}{2}$ and going up to 27 $\frac{1}{2}$ volts. It is 3 $\frac{3}{4}$ x3x3 inches, weighs 3 pounds and is designed for an output of 50 watts..... 3.20

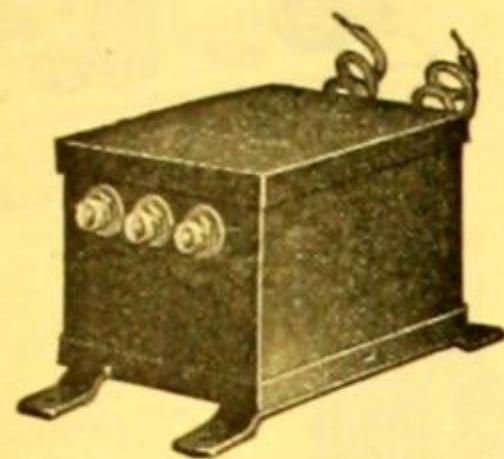
F3871. **TRANSFORMERS, Step-Up.** These Transformers represent the highest type of construction, and are perfect in every detail. Constructed with a magnetic shunt control to protect them from all undue current surges. Designed to connect to any alternating current circuit. No impedance coil or other resistance necessary. Can be used for Wireless Work, Generation of Ozone, Testing Insulation, Electrostatic Separation, High Frequency Experiments, etc.

For operation on voltages ranging between 100 and 125 A. C., 60 cycles. Current regulates as per table below. No.

No.	B	C
Kilowatts	$\frac{3}{4}$	1
Secondary voltage	10,000	20,000
Primary amperes	2 to 9	2 $\frac{1}{2}$ to 14
Height, inches	10	14
Width, inches	5	6
Length, inches	10	12
Weight, lbs.	31	46
Each	28.00	40.00

F3873. **TRANSFORMER, Step-Up,** similar to No. F3871, but without the magnetic shunt; especially adapted to wireless work. Capacity, $\frac{1}{4}$ k.w.; secondary voltage, 8000; size, 9x4 $\frac{1}{2}$ x6 inches; weight, 13 lbs..... 10.00

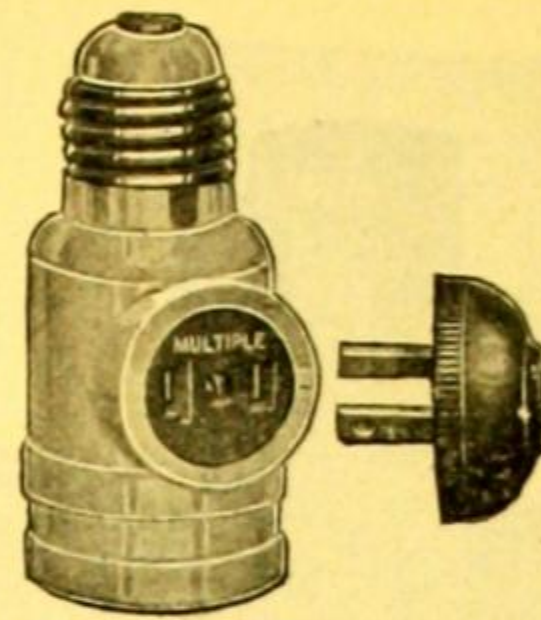
F3875. **RESISTANCES, Non-Inductive,** for use with Nos. F3871-3, connected in shunt across the primary terminals for prevention of inductive kick-backs in the primary circuit.....Per pair 2.50



No. F3879B.



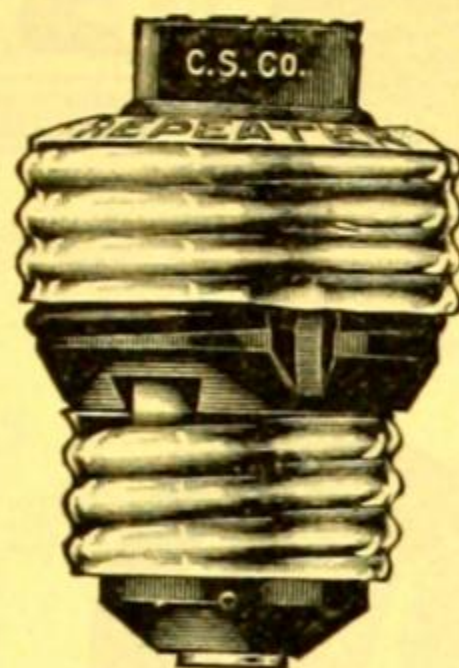
No. 5100.



Nos. 5102-3.



No. 5106.



No. 5112.



No. 5113.



Nos. F3405-6.



No. 5114.



No. 5116.

F3879. TRANSFORMERS, Bell Ringing. Designed for ringing bells and buzzers and operating annunciators, burglar-alarm systems and gas lighting systems. They are intended for connection directly to the 110-volt, 60-cycle A. C. mains, are absolutely fireproof and may be short circuited indefinitely without burning them out or impairing their efficiency. Dimensions, 15x10.5x11 cm.

No.	B	C
Secondary voltage	6-14-20	6-12-18-24
Capacity, watts	60	100
Weight, lbs.	7½	9
Each	\$6.00	8.00

WATER BATHS, see general heading **Water Baths.**

ELECTRICAL ACCESSORIES

5100. ATTACHING PLUG, fuseless, Edison, black moulded material with separable plug (No. 5116).
..... 10% discount in lots of 10, 20% discount in lots of 100. .33

5102. ATTACHING PLUG for multiple work, porcelain. One end fits any Edison receptacle or socket, and the other is provided with Edison socket for incandescent lamp. At the side is a separable plug (No. 5116) for attaching a lamp cord which will be in multiple with the lamp in the socket90

5103. ATTACHING PLUG for series work. Same as No. 5102 except that the lamp cord will be connected in series with the lamp in the socket 1.40

5106. CUT-OUT, Standard Plug Fuse. Double pole, Edison sockets, slotted porcelain base, for 125 volts, 30 amperes. Without fuse plugs.33

10% discount in lots of 10.

5112. FUSE PLUG, Edison, Repeater (patented), containing six links, each of which may in turn be moved into the proper position to replace the one previously burned out, by turning the handle at the top. When all are used up, the link holder may be unscrewed and a new set of links quickly inserted. No. B C D E

Carrying capacity, amperes..... 6 10 15 30

Each35 .35 .35 .35

5113. RENEWALS for No. 5112, consisting of 6 combined links Each .20 .20 .20 .20

For FUSE WIRE see No. 14438.

LAMPS, Incandescent, see general heading **Lamps.**

F3405. POLARITY INDICATOR. Indicates instantly the negative and positive poles when connected in circuit. Size, 2.5x9 cm. Nickel-plated shell which covers and protects the glass tube from injury. For voltages up to 50..... 2.70

F3406. POLARITY INDICATOR. Same as No. F3405, but for voltages from 50 to 600..... 2.70

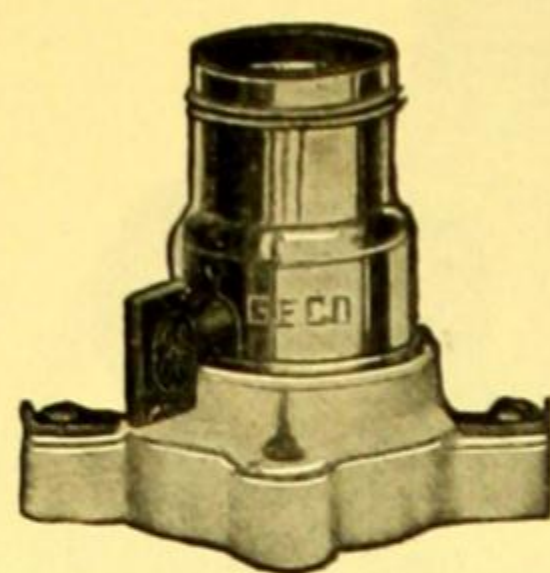
F3409. POLE-INDICATING PAPER. When two electrical leads, or terminals, are placed close together upon a piece of the moistened paper, the negative pole shows a red stain. In books of 25 strips, 7x1 cm Per book .15

For PUSH BUTTONS see Nos. 1198-1200.

For RADIO APPARATUS, send for **CATALOG W.**

5114. RECEPTACLE, to take No. 5116 Plug, for open wiring; porcelain..... .45

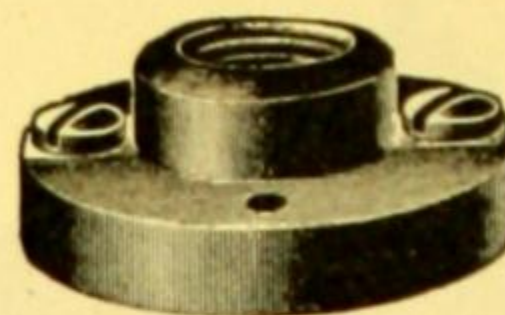
5116. PLUG, for No. 5114 Receptacle, with two finger contacts; black moulded material. Used also on Nos. 5100, 5102 and 5103..... .30



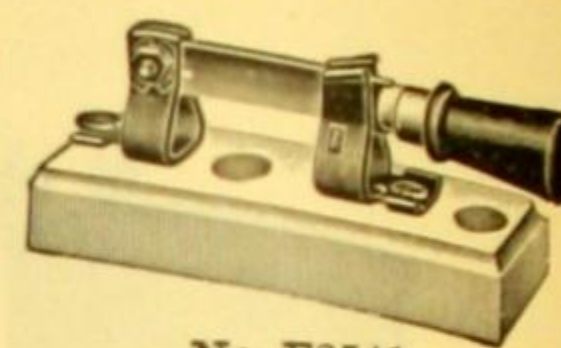
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No. 5120.



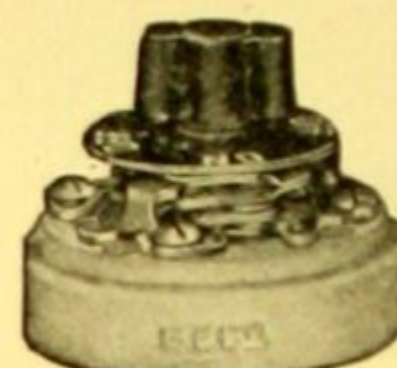
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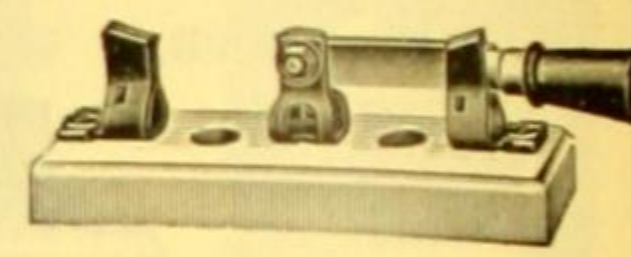
No. F3541.



No. 5130.



No. 5134.



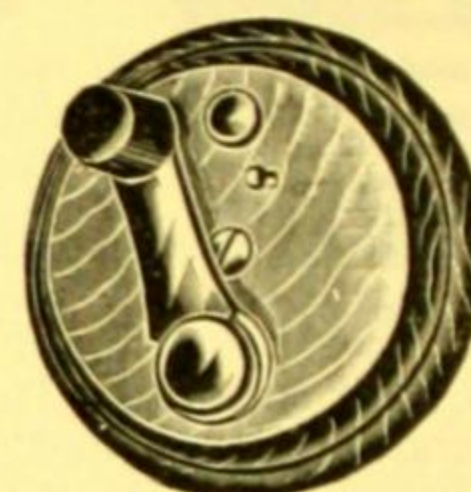
No. F3542.



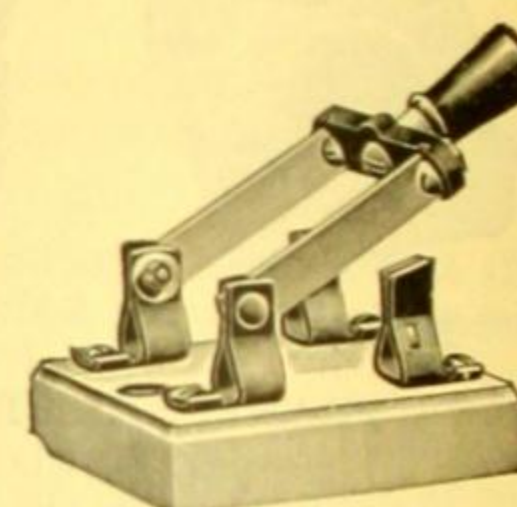
No. 5128.

No. 5128
Shell.

No. 5132.



Nos. F3561-3.



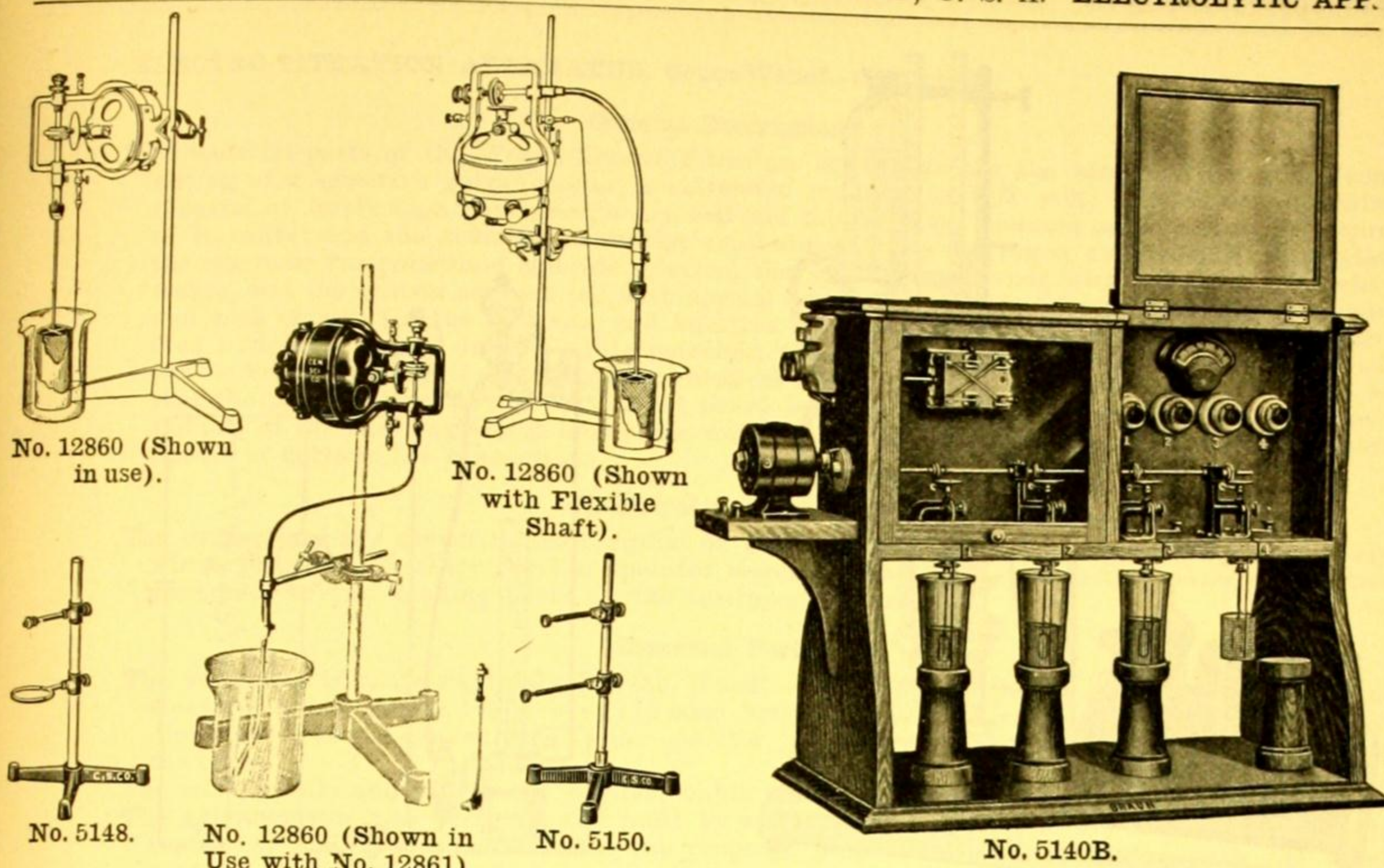
No. F3543.

5118. **RECEPTACLE, Key**, for open wiring, Edison; porcelain base, brass shell..... \$1.10
5120. **RECEPTACLE, Keyless**, for open wiring, Edison; porcelain28
10% discount in lots of 10, 20% discount in original package of 250.
5122. **RECEPTACLE, Mounted**. No. 5120 Receptacle mounted on a wood base 10x10 cm, with binding posts. Suitable for use with any Edison base incandescent lamp..... 1.40
5124. **RECEPTACLE, Miniature**, porcelain, for No. 8196 Lamps18
10% discount in lots of 10.
5128. **SOCKET, key**, Edison, brass, for use on lamp cord; may also be used on $\frac{1}{8}$ inch I. P. size male thread. Of new design, having the two parts of the shell held together by a threaded brass ring which is readily removed when the socket is to be rewired. (Illustration shows construction clearly)60
10% discount in lots of 10.
5130. **SOCKET, keyless**, Edison, porcelain, with two finger contacts for use with Nos. 5100, 5102, 5103 and 5114 in place of the separable plug..... .42
10% discount in lots of 10.
- SPARK COILS**, see Induction Coils.
- F3541. **SWITCH, Knife**, porcelain base, single pole, single throw, 25 amperes. Base about 3x8 cm.. .35
- F3542. **SWITCH, Knife**, porcelain base, single pole, double throw, 25 amperes. Base about 3.5x10 cm .50
- F3543. **SWITCH, Knife**, porcelain base, double pole, single throw, 25 amperes. Base about 5x6.5 cm. .55
- F3544. **SWITCH, Knife**, porcelain base, double pole, double throw, 25 amperes. Base about 6.5x10 cm .80
- F3561. **SWITCH, Wood Base**, 1 point, about 6.5 cm in diameter20
- F3562. **SWITCH, Wood Base**, 2 point, about 6.5 cm in diameter22
- F3563. **SWITCH, Wood Base**, 4 point, about 6.5 cm in diameter40
10% discount in lots of 10 from list prices of Nos. F3541 to F3563.
5132. **SWITCH, Push Through**, for use on lamp cord, for 125 volts, 6 amperes or 250 volts, 3 amperes; black moulded material..... .80
5134. **SWITCH, Snap**, double pole, slotted porcelain base, for 250 volts or less, 10 ampere current. Indicates whether current is on or off..... 1.50
5136. **TAPE, Insulating**, cloth base, $\frac{3}{4}$ inch wide, black, best quality; will not dry out. In quarter pound rolls Per roll .25

TELEPHONE APPARATUS, see CATALOG F of Physical Apparatus.

WIRELESS APPARATUS, see CATALOG W.

For other **ELECTRICAL APPARATUS**, see Physical Chemistry Apparatus.



ELECTROLYTIC ANALYSIS APPARATUS

5140. **ELECTROLYTIC OUTFIT**, Braun, for the quantitative separation of metals. Extensively used for determining copper by the rotating anode. A complete determination can be made by this method in less than half an hour. The apparatus is equipped with a motor mounted at one side to which a line shaft is attached, from which each unit is driven by a special friction device enabling the operator to use one or more units at one time. The speed is regulated by a rheostat. A separate rheostat controls the current supplied to the individual units, each unit having an individual switch. Revolving anodes and gauze cathodes should be used. The ammeter, line shaft, bearings, switches, etc., are all enclosed in glass to prevent coming in contact with acid fumes. The lower portion of the cabinet is covered with aluminum and the binding posts are also made of this material.

Direct Current is necessary and where Alternating Current only is obtainable a Motor-Generator Set should be obtained. (See Nos. 4826 to 4848.)

Complete with ammeter, rheostats for motor and units, and stands for beakers, with instructions for mounting and operating. Without platinum-electrodes. No.

	A	B
Number of units.	2	4
Each	\$188.00	217.00

For **PLATINUM ELECTRODES**, for use with Nos. 5140 and 12860, see Nos. 10806C and 10812B.

5148. **ELECTROLYTIC SUPPORT**, with glass rod mounted on japanned iron tripod base, ring for dish with three platinum contact points and clamp for anode. Binding posts are provided on both ring and clamp. Height of rod, 11½ inches; diameter of ring, 2¼ inches. 6.00

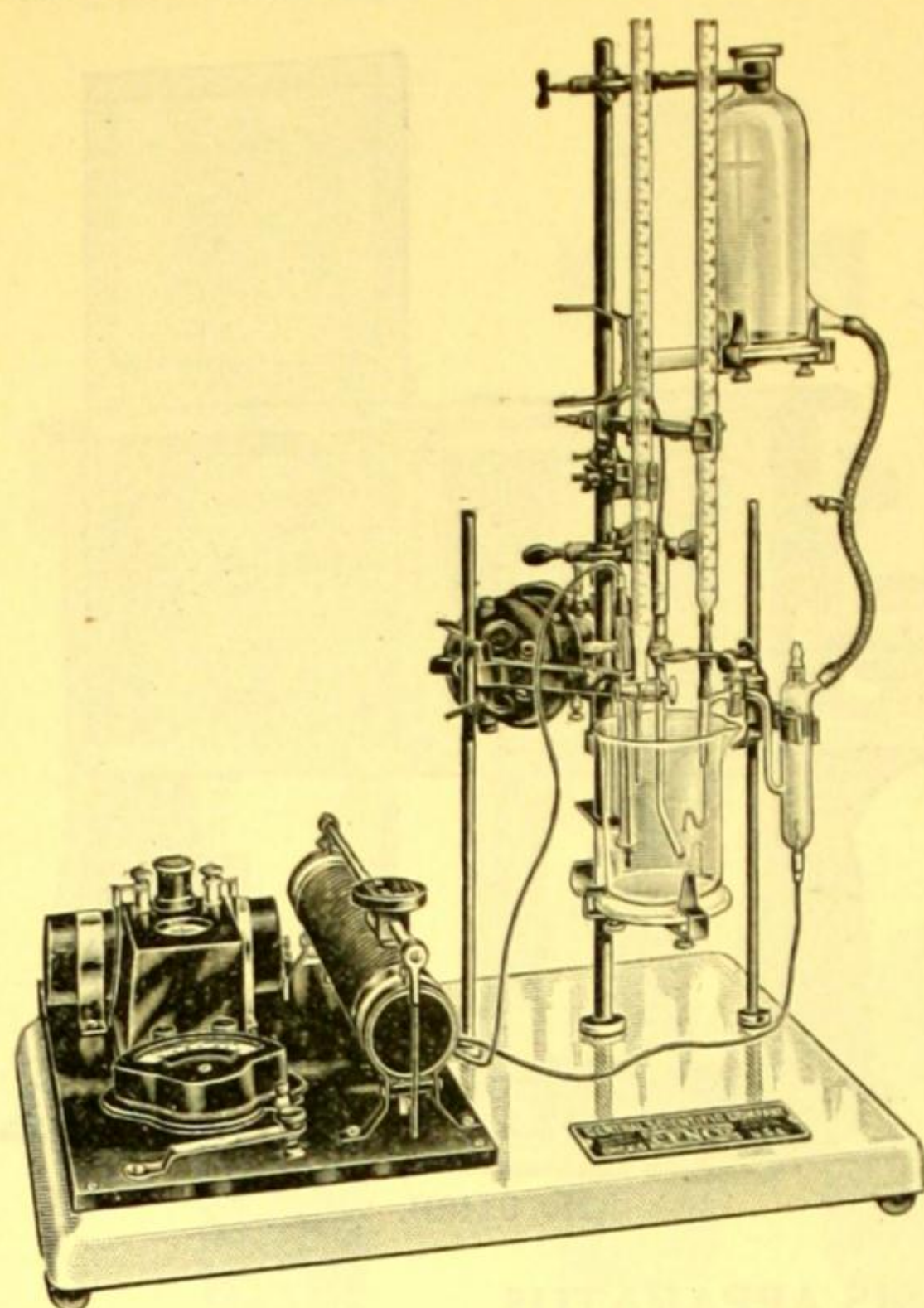
5150. **ELECTROLYTIC SUPPORT**, same as No. 5148, but with two clamps with binding posts 5.00

12860. **ELECTROLYTIC ROTATOR**, Cenco Variable Speed, consisting of a 1/50 horse power motor, carefully selected for the excellent characteristics, fitted with a yoke containing a secondary shaft. The speed of this shaft may be varied by moving a friction-driven disk attached to it across the face of a metal disk on the end of the motor shaft. In this way the speed may be varied from zero to the maximum speed of the motor, about 3000 r. p. m., and the direction of rotation may be reversed without stopping the motor. Two interchangeable chucks are supplied with the rotator, one for holding a 6 mm glass rod for stirring purposes, the other for holding the wire or stem of an electrode. Two binding posts are attached to the frame, one of which being grounded is used to carry the current to the rotating electrode; the other is insulated from the frame and has an adjustable chuck to receive the connection and the stationary electrode. A clamp of special form is attached to the yoke by which the rotator may be clamped to any support stand. By means of Flexible Shaft No. 12861 listed below, the motor may be swung to one side, away from conflicting apparatus or out of the range of corrosive fumes.

Complete as described, with connecting cord and attachment plug, but without support stand, flexible shaft, stirring rod or electrodes. No.

	A	B	C	D
	A. C.		D. C.	
For volts	110	220	110	220
Each	35.00	37.00	35.00	37.00

12861. **Flexible Shaft**, 12 inches long, for use with No. 12860, with guide to provide bearing for lower end. Can be attached to support by any ordinary right angle clamp (see our No. 2914) 4.00



No. 10312.

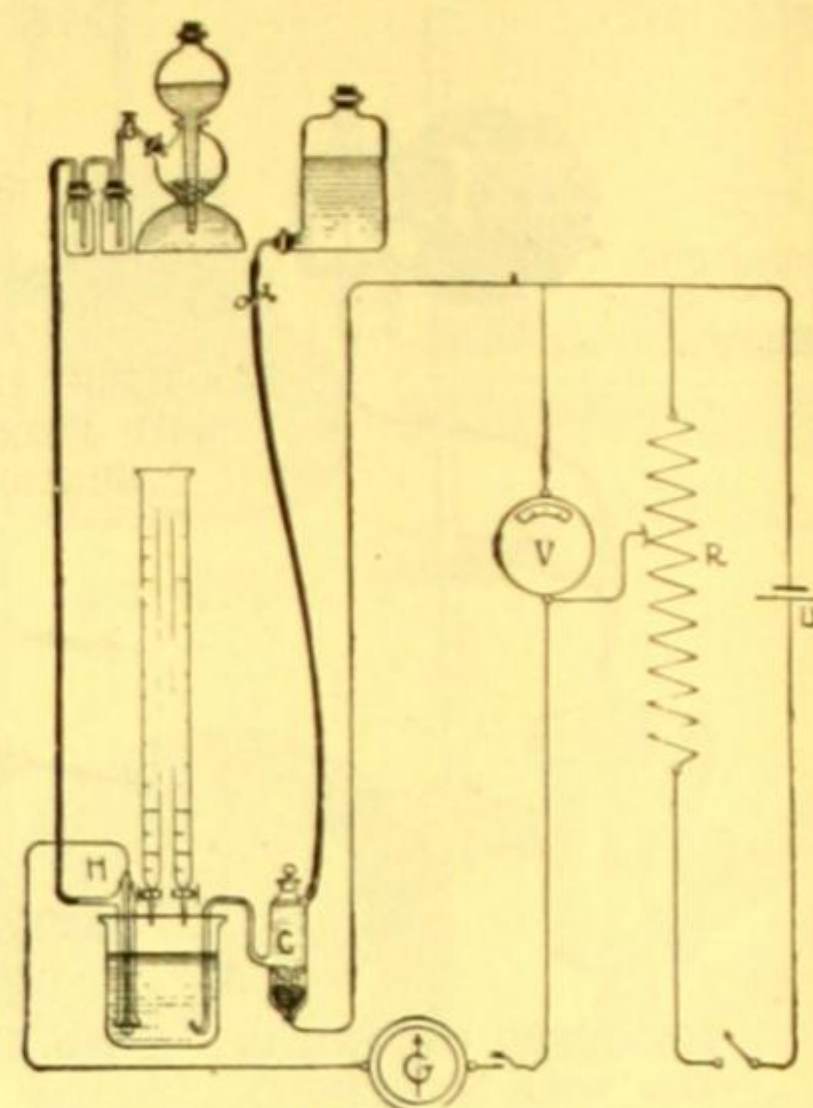


Fig. 1.

Diagram Showing Electrical Connections.

10312. **ELECTRO-TITRATION APPARATUS, Cenco-Wendt, Improved Form**, for determining the end point in electro-titrations, and for determining the concentration of hydrogen-ions (pH) in solution to the first decimal place (0.1 pH). This apparatus resulted from a suggestion by Dr. Gerald L. Wendt, of the University of Chicago, that an Electro-Titration Apparatus be developed which would be simple in form and economical in price, and which could be readily used by the analytical chemist or the bacteriologist, unfamiliar with the complicated and sensitive apparatus used by the physical chemist for his more precise determinations.

The Method

The method is that made use of by Hildebrand and others in which the potential existing between the hydrogen (or platinum) and calomel electrodes, which depends upon the concentration of H, OH or metallic ions in the solution, is balanced against that of a dry cell by means of a variable resistance. The size and direction of the galvanometer deflection indicate to the operator the proximity to equilibrium and the proper direction to move the rheostat slider to secure it. The voltmeter reading gives the potential of the system at the end point, which is characteristic for each reaction. By plotting the readings of the voltmeter against the amounts of reagent added, a complete history may be obtained of each reaction, and the potential corresponding to the end point determined. Ensuing titrations may be carried on quite rapidly since the voltmeter serves as a guide to the stage of the reaction and thus prevents the operator going past the end point.

Applications

The fact that titrations may be made and the end point accurately determined in solutions in which interfering colors, turbidity, precipitates, or other dissolved material preclude the use of indicators, makes the Electro-Titration apparatus invaluable to the analytical chemist. The rapidity with which determinations of hydrogen-ion concentrations may be made, without the necessity for titration, in culture media, body fluids, plant juices, etc., renders it equally valuable to the bacteriologist, biochemist, and plant physiologist. Plant control is easily effected by its use in those industries in which reactions are carried out on a large scale at a certain definite acidity or alkalinity, and it is being successfully employed for this purpose in Textile Dyeing Plants, Dye Manufactories, Bleaching Plants, and Gelatine Factories. By the use of this method, investigations have been or are now being made and important conclusions reached in the study of the baking qualities of flour, the fermentation of fruit juices, the aging of milk, the "pickling" of steel, the evaluation of phosphates, the lime requirements of soils, etc. New fields of investigation are constantly being opened up and baffling problems of long duration are being solved by the application of the electro-metric method.

(Continued on following page.)

ELECTRO-TITRATION APPARATUS, Cenco-Wendt—Continued.**General Description**

The essential parts of the Wendt Electro-Titration Apparatus are the **electrical assembly**, consisting of a sensitive galvanometer, a voltmeter reading to 0.01 volt, a variable slide-wire rheostat of fairly high resistance, a dry cell and tapping key, mounted on an instrument board of Bakelite; and the **chemical assembly**, consisting of the hydrogen and calomel electrodes, the reservoir for potassium chloride solution, the small support rods with clamps for the electrodes, and the central support rod with special enameled supports for beaker and reservoir, and with clamps for the reservoir and burettes. The parts are mounted on an iron base covered with a coating of durable white porcelain fused-on, which provides a work table which can be kept clean and is unaffected by chemical reagents. The porcelain base is designed so that the part upon which the instrument board is mounted is raised about one-half inch above the rest of the base, making it impossible for chemical reagents to creep beneath it and short circuit or corrode the connections.

Electrical Connections

The connections are shown in the diagram on the preceding page. The apparatus is completely wired, it being necessary for the operator merely to fasten the connecting wires of the two electrodes to two binding posts on the instrument board.

Essential Parts

The **voltmeter** is made expressly for the Wendt Apparatus by the Weston Electrical Instrument Co. It has a scale $4\frac{3}{8}$ inches (110 mm) long, graduated to read to 1.2 volts by 0.01 volt divisions. For the convenience to the operator, pH units are indicated on the lower side of the scale.

The mirror scale and knife-edge pointer enable readings to be made to 0.001 volt by estimation. The **galvanometer** was designed and built by us for the Wendt Electro-Titration Apparatus. Its sensibility and other characteristics are properly proportioned to harmonize with the other parts of the electrical system.

The **rheostat** is of our Cenco slide-wire type, with resistance sufficiently high to permit the dry cell to remain permanently connected across its terminals. The number of turns is such that an accurate setting of the slider can be readily made.

The **hydrogen electrode** is a modification of the Hildebrand type in which a platinum electrode of small surface area is used to reduce the time required for saturation.

The **calomel electrode** is a modification of earlier types, combining the good features of several, such as the stop-cock in the siphon tube, the bent end of the latter and the tubulature at the top with ground stopper.

The **porcelain enameled support** for the beaker is provided with adjustable clamps so that various size beakers may be used.

Same method of continuous stirring is necessary in electro-titrations and in H-ion determinations. For those laboratories which are not already equipped with motor stirrers, we recommend our No. 12860 **Cenco Universal Motor Stirrer**, which may be clamped on the central support rod at the back and, by means of **Flexible Shaft** No. 12861, as shown in the illustration on page 216, provide proper agitation of the contents of the beaker at any desired speed.

Other items not included with the outfit which must be supplied are the burettes, beaker and stirrer. We strongly recommend the use of **standardized burettes**, since the accuracy of the determinations in electro-, as in other titration work, depends upon the accuracy with which the volumes of the reagents are measured.

All parts of the apparatus are beautifully finished, the instruments in dull japan (rubber finish), and the support rods and clamps in polished nickel-plate. The combination of black instruments and nickel-plated metal parts with the white porcelain covered base presents a beautiful appearance, making the instrument one which harmonizes with those in any well-kept laboratory, chemical or biological.

ELECTRO-TITRATION APPARATUS, Wendt, Improved Form, as described above, complete with glass reservoir, hydrogen and calomel electrodes, necessary clamps and supports and with complete directions for use. **Without burettes, beaker or motor stirrer.**.....\$150.00

10252. **ELECTRODE, Calomel, Wendt's**, only of No. 10312 7.00

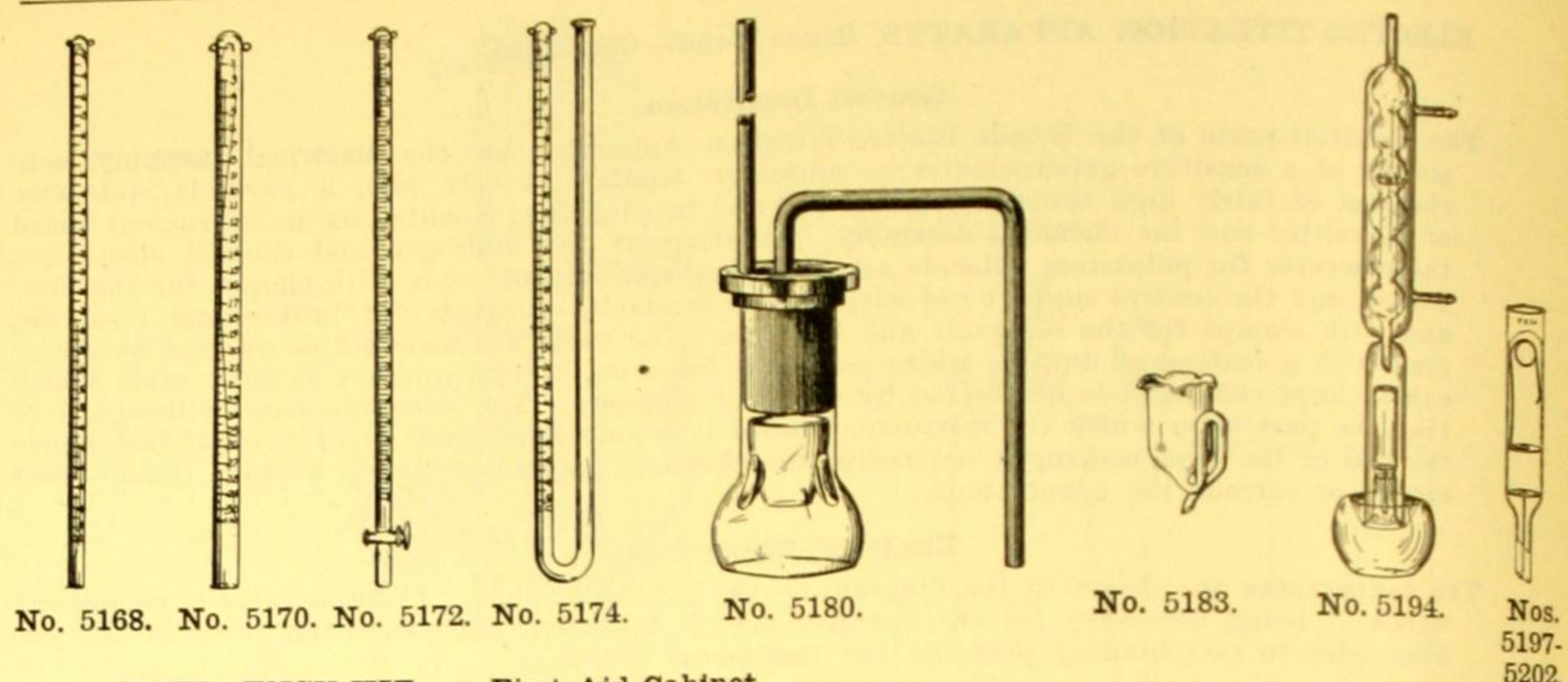
10284. **ELECTRODE, Hydrogen, Wendt's**, only of No. 10312 6.00

Note:—For a complete explanation of the principles underlying electro-titration, and for detailed directions for their application to various chemical determinations, send for Bulletin 86.

12860. **MOTOR STIRRER, Cenco Universal Friction-Drive**, for use with No. 10312 for maintaining continuous agitation during titration. Complete with connecting cord and attachment plug, but without stirring rod.

No.	A	B	C	D
	A.C.		D.C.	
For volts	110	220	110	220
Each	35.00	37.00	35.00	37.00

12861. **Flexible Shaft and Guide**, for use with No. 12860, enabling the Stirrer to be turned to one side, where it will not interfere with the working parts of the apparatus. The guide is attached to the central support rod by means of the right angle clamp furnished with No. 10312 4.00

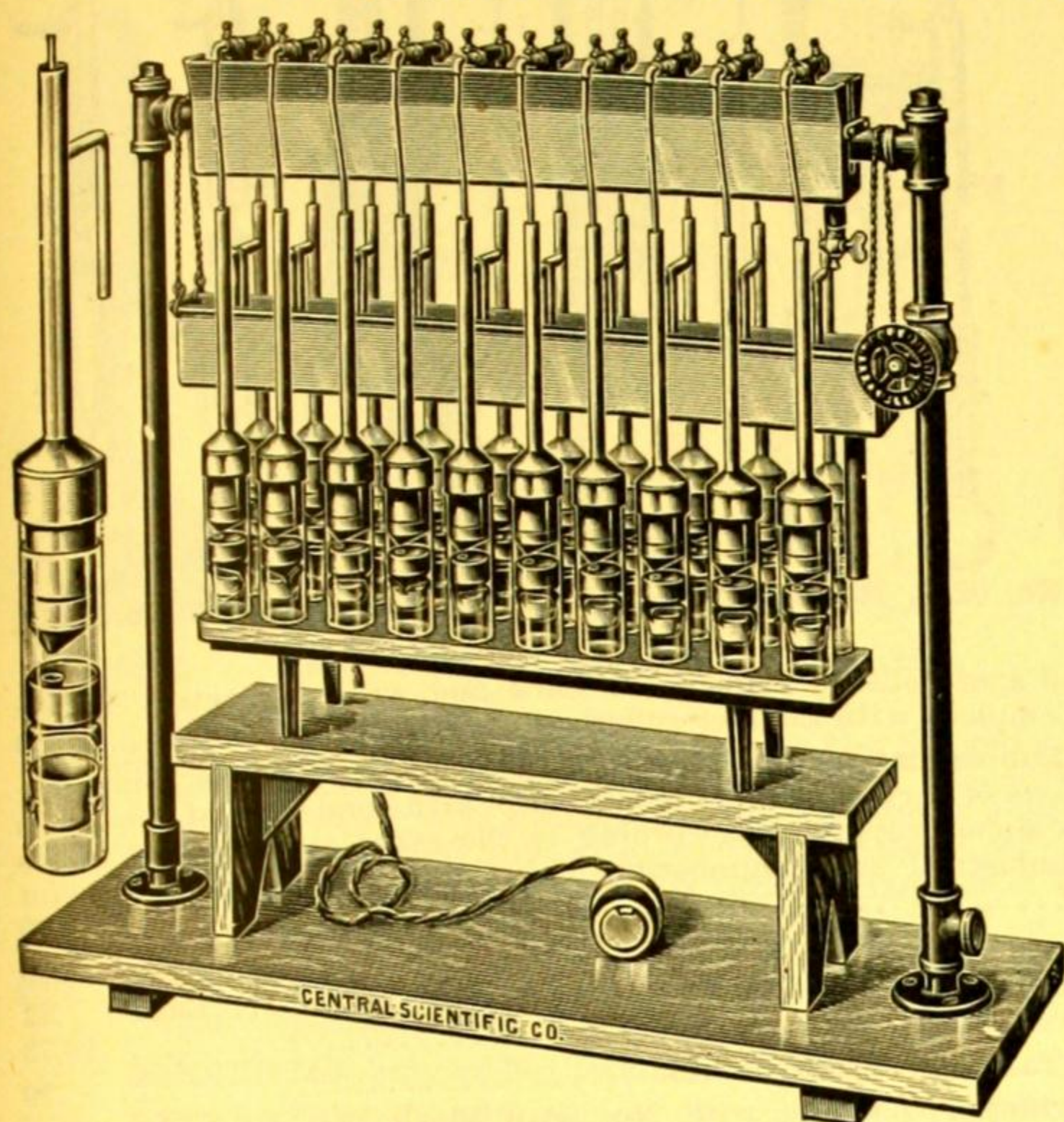


EMERGENCY KIT, see First Aid Cabinet.					
5160.	EMERY CLOTH, in sheets 9x11 inches.				
	No.	000	00	0	1
	Per sheet.....	\$0.12	.12	.12	.13
	Per quire.....	2.30	2.30	2.30	2.50
5162.	EMERY PAPER, in sheets 9x11 inches.				
	No.	0000	000	00	0
	Per sheet.....	.06	.05	.05	.05
	Per quire.....	1.20	1.00	1.00	1.00
5168.	EUUDIOMETERS, Bunsen's, with platinum electrodes.				
	Capacity, cc.....			50	100
	Graduated in, cc.....			1/10	1/5
	Each			3.10	3.30
5170.	EUUDIOMETER, Bunsen's, with platinum electrodes; graduated to 500 mm in one mm divisions				3.00
					
	EUUDIOMETER, Hoffman's, see Lecture Apparatus.				
5172.	EUUDIOMETER, Mitscherlich's, with glass stop-cock and platinum electrodes. Graduated to 50 cc in 1/5 cc.....				4.00
5174.	EPDIOMETER, Ure's, U form, with platinum electrodes, 50 cc; graduated in 1/5ths.....				3.20

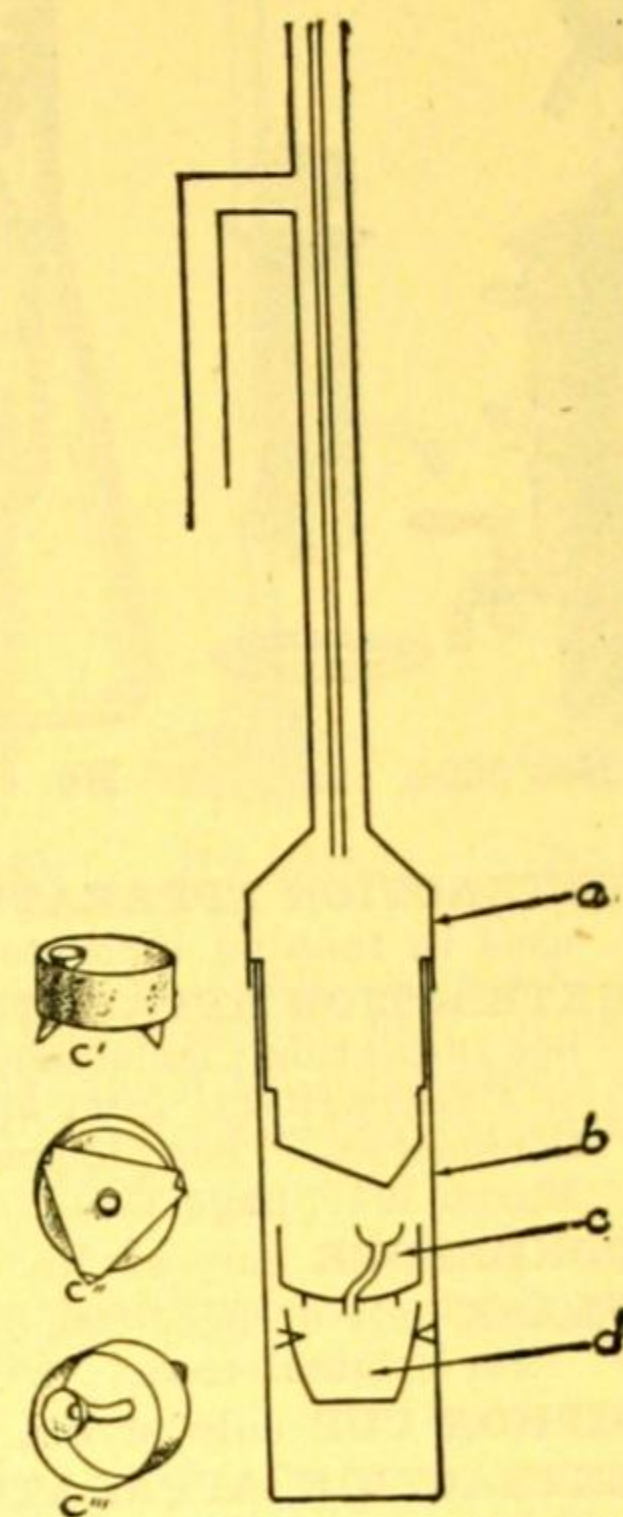
EXTRACTION APPARATUS

5180.	EXTRACTION APPARATUS, Bailey-Walker, consisting of a metal condenser, small glass flask of special shape, and a small glass siphon cup. This is one of the most compact forms of extraction apparatus and can be used for any kind of work. The flask is light and can be accurately weighed and easily cleaned. Made according to the design of Bailey and Walker, of the Bureau of Chemistry, United States Department of Agriculture. (See Journal of Industrial & Engineering Chemistry, Vol. VI, No. 6, for June 1914, page 497).....	6.00
5181.	CONDENSER only of No. 5180.....	4.40
5182.	FLASK only of No. 5180.....	.80
5183.	SIPHON CUP only of No. 5180.....	.80
5184.	GOOCH CRUCIBLE, Porcelain, 25 cc, with holes for suspension; for use with No. 5180, for percolation method	.50
5194.	EXTRACTION APPARATUS, Knorr's, modified by Walter & Goodrich. Complete with Condenser No. 5195, extraction tube, perforated nickel lower disk and flask for mercury seal with holes for ether return, but without spring or upper perforated disk. (See Circular No. 69, Bureau of Chemistry, United States Department of Agriculture).....	5.25
	Extra Parts for No. 5194.	
5195.	CONDENSER only of No. 5194 with adapter sealed on.....	3.50
5197.	EXTRACTION TUBE, improved form, without projections or sealed-in disk. Without wire spring or disk	.60
5198.	SPRING for No. 5197 to press sample against lower disk.....	.30
5199.	DISK, upper, for No. 5197, of nickel.....	.25
5200.	DISK, upper, for No. 5197, of platinum.....	at market price
5201.	DISK, lower, for No. 5197, of nickel.....	.40
5202.	DISK, lower, for No. 5197, of platinum.....	at market price
5656.	EXTRACTION FLASK, improved form, as used in No. 5194, with two holes in neck for return flow of ether.....	.70

PICKEL ELECTRIC EXTRACTION APPARATUS



No. 5203.



Sectional Diagram Showing Details.

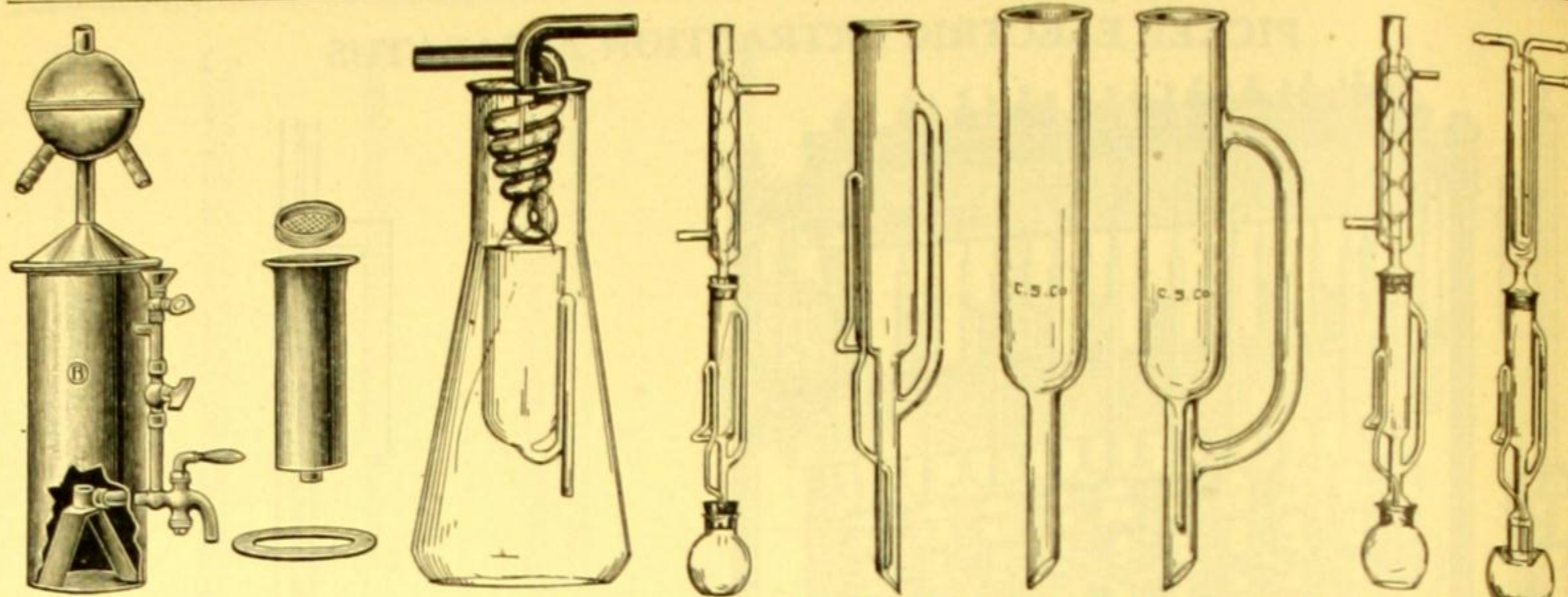
5203. **EXTRACTION APPARATUS**, Pickel's, designed by the late Dr. J. M. Pickel of the Feed Laboratory of the North Carolina Department of Agriculture to permit the more rapid and convenient handling of routine extractions of feeds in experimental station work. Not only is greater rapidity secured through the use of this apparatus, but also greater economy is effected due to the small amount of ether required (15 cc), the recovery of $\frac{1}{3}$ to $\frac{1}{2}$ of this and the small amount of space occupied by each unit, permitting 20 to be used at one time on a $4\frac{1}{2} \times 24$ inch hot plate.

The arrangement for recovering the ether is very ingenious. The details of a single unit are shown in the line drawing, where it will be noted that the metal condenser ends in an eccentrically located point. An ether recovery cup of metal rests on the crucible below this point. When the apparatus is turned to the position shown, the ether condensing on the point drips through the small funnel upon the sample in the special alundum crucible. When the extraction is completed, the apparatus is turned a few degrees, so that the condensed ether drips into the recovery cup. The residue in the crucible and the fat in the bottom of the glass cylinder are then ready to weigh.

In the complete outfit shown above, the supporting frame work consists of half-inch iron pipes, fastened by flanges to a heavy wooden base. A one-half inch tee is provided for connecting the apparatus directly to the water main in the laboratory. A valve above the inlet permits control of the flow of water which is distributed through tees, stop-cocks and small pipes to the condensers. The water from the condensers flows into the drain trough, provided with an outlet which may be connected by rubber tubing to the sink. A catch basin is suspended from the horizontal pipe to catch any leakage from the stop-cocks and convey it to the drain trough. A wooden bench furnishes support for the hot plate. The condensers are lifted when one desires to remove the extraction tubes and may be hung over the edge of the drain trough, when not in use. When the outfit is permanently connected to the water line and electric connections are provided, the Pickel Extraction Apparatus forms a very compact, economical and convenient unit for an analytical laboratory. (See Journal of Ind. & Eng. Chem., Vol. XI, No. 11, for November, 1919. For further details, send for our Bulletin No. 94).

Complete as illustrated with three-heat hot plate with connecting cord, plug and support, twenty sets of glass cylinders with special alundum extraction crucibles, ether recovery cups and condensers, iron piping and supports.

	A	B
No.	110	220
For volts	\$275.00	275.00
Each		
5203C. EXTRACTION APPARATUS , Pickel, consisting of a single extraction unit of No. 5203, with glass cylinder, alundum crucible, metal condenser and ether recovery cup.....		16.00
5203D. ALUNDUM CRUCIBLES only of No. 5203C, for replacement	each,	1.00
5203E. GLASS CYLINDERS only of No. 5203C, for replacement	each	1.40



No. 5204.

No. 5206.

No. 5212.

No. 5213.

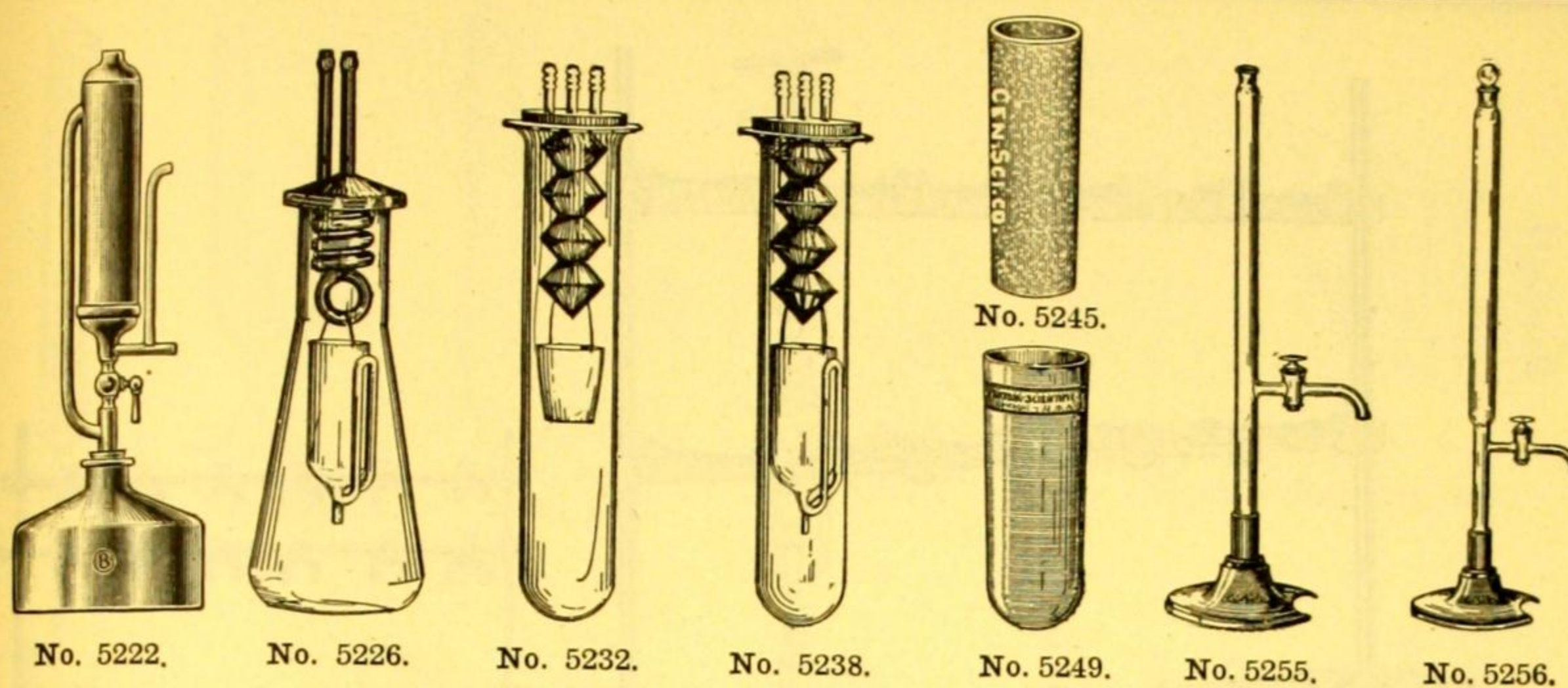
No. 5214C.

No. 5214D.

No. 5216.

No. 5218B.

5204. **EXTRACTION APPARATUS**, Reed's, of polished copper, for bark and wood extracts. Widely used in tanning laboratories. Complete with Soxhlet spherical condenser.....\$42.50
5206. **EXTRACTION APPARATUS** for Rubber Insulating Material, as recommended by the Joint Rubber Insulation Committee. Consists of a glass flask of special size with condenser of the Cottle or Underwriters' form and glass siphon cup, made according to the exact specifications of the Committee. (See Journal of Industrial and Engineering Chemistry, Volume IX, No. 3, for March 1917, page 310)..... 3.00
5207. **CONDENSER** only of No. 5206..... 2.00
5209. **FLASK** only of No. 5206, of Pyrex Glass. Number in original case, 72.....Each .32
Per original case..... 20.73
5210. **SIPHON CUP** only of No. 5206. Takes an 80x22 thimble70
5212. **EXTRACTION APPARATUS**, Soxhlet's, complete with No. 5646 Flask, No. 5213 Extraction Tube and No. 5215 Allihn's Condenser, fitted with fine grained cork stoppers for connection.
- | No. | A | B | C |
|---|-------|-------|--------|
| Capacity to top of siphon, cc..... | 50 | 75 | 210 |
| Height of siphon tube, mm..... | 70 | 70 | 113 |
| Approximate inside diameter, mm..... | 30 | 38 | 50 |
| Suitable for extraction thimbles, mm..... | 80x22 | 80x33 | 123x43 |
| Length of condenser jacket, inches..... | 8 | 8 | 10 |
| Size of flask, cc..... | 100 | 150 | 250 |
| Each..... | 3.50 | 4.00 | 4.50 |
5213. **EXTRACTION TUBES** only of No. 5212..... 1.50 2.00 2.40
5215. **CONDENSERS** only of No. 5212.....Each 1.40 1.40 1.50
- CONDENSERS**, Soxhlet's, for use with No. 5212, see No. 3234.
- 5214C. **EXTRACTION APPARATUS**, Butt's Extraction Tube, Pyrex Glass, designed especially for cottonseed meal. The stem is large enough to permit vapors to flow up into the tube and condensate to flow down at the same time. In a series of tests, this form of tube was found to be more efficient than the type usually employed for cottonseed meal. Hulls may be extracted also with entire satisfaction. The extraction thimble (80x25 or 80x22 mm) should be supported by a coil of wire or a roll of gauze. This tube may be used in place of No. 5213 in the usual Soxhlet assembly..... .60
- 5214D. **EXTRACTION APPARATUS**, Smalley's Extraction Tube, as used by the Southern Cotton Oil Company. This tube, while retaining many of the good features of the Soxhlet, has the advantage of lower cost of manufacture and decreased fragility..... 1.75
5646. **EXTRACTION FLASKS** only No. 5212,
- | | | | |
|---------------------------------------|-----|-----|-----|
| Capacity, cc. | 100 | 150 | 250 |
| Approximate diameter of neck, mm..... | 27 | 32 | 35 |
| To take cork stopper, No..... | 14 | 18 | 20 |
| Each..... | .18 | .20 | .22 |
- For other **EXTRACTION FLASKS**, see **Flasks, Extraction**.
5216. **EXTRACTION APPARATUS**, Soxhlet's, similar to No. 5212, but with all joints ground. Complete with three flasks ground to fit extraction tube.
- | No. | A | B | C |
|------------------------------------|------|------|------|
| Capacity to top of siphon, cc..... | 50 | 75 | 210 |
| Each..... | 6.00 | 7.00 | 8.00 |
- 5218B. **EXTRACTION APPARATUS**, Soxhlet's, with Hopkins Inner Cooled Condenser ground to fit into Soxhlet extraction tube, with Knorr flask for mercury seal, preventing any leak of ether vapor. Capacity, to top of siphon, 75 cc; approximate inside diameter of extraction tube, 38 mm. Capacity of flask, 100 cc..... 7.50
- 5220B. **EXTRACTION APPARATUS**, same as No. 5218B, but with Sy's flask for mercury seal in place of Knorr's. Capacity of flask, 100 cc..... 7.50
- For extra **Flasks** for Extraction Apparatus, see **Flasks, Extraction**.



5222. **EXTRACTION APPARATUS, Teas'**, for the extraction of tanning materials, as used by the Association of Official Agricultural Chemists. Consists of a heavy copper flask of one liter capacity, fitted with ground in copper extractor lined with tin, and a tin lined copper Soxhlet condenser. A side tube is provided for removal of percolate and for flooding the contents of the extraction tube. Height, 18 inches; diameter of flask, 7 inches.....\$27.00
CONDENSER only of No. 5222, see No. 3234.
5226. **EXTRACTION APPARATUS, Underwriters' Laboratories Improved Form**, with glass siphon cup. (See "Standards for Rubber Covered Wires and Cables," 1915)..... 3.35
5227. **CONDENSER** only of No. 5226..... 2.20
5228. **EXTRACTION FLASK** only of No. 5226, of Pyrex Glass32
5229. **SIPHON CUP** only of No. 5226..... .75
5232. **EXTRACTION APPARATUS, Wiley's**, consisting of nickel-plated copper condenser, tin lined, special form, with suspended porcelain Gooch crucible, arranged to fit into straight glass tube with ground flange, rendering the use of stoppers unnecessary. Both residue and extracted matter may be easily weighed..... 7.40
5233. **CONDENSER** only of No. 5232..... 6.00
5235. **GLASS TUBE** only of No. 5232..... .90
5184. **GOOCH CRUCIBLE** only of No. 5232, with holes for suspension..... .50
5238. **EXTRACTION APPARATUS, Wiley's, Modified by Richardson**, with glass siphon cup. Especially adapted for extraction of tankage, cotton-seed meal, meat, soap, etc. (See Journal of Industrial and Engineering Chemistry, Vol. IV, No. 3, for March 1912, page 221)..... 7.75
5239. **GLASS SIPHON CUP** only of No. 5238..... .90
5235. **GLASS TUBE** only of No. 5238..... .90
5245. **EXTRACTION THIMBLES, Alundum**, for the extraction of soaps, fats, food, rubber, etc., by both organic and inorganic solvents. Very rapid, practically indestructible and readily cleaned by ignition. Medium porosity carried in stock. Fine and coarse porosities can be supplied on short notice. Thickness of wall, approximately 1 mm.

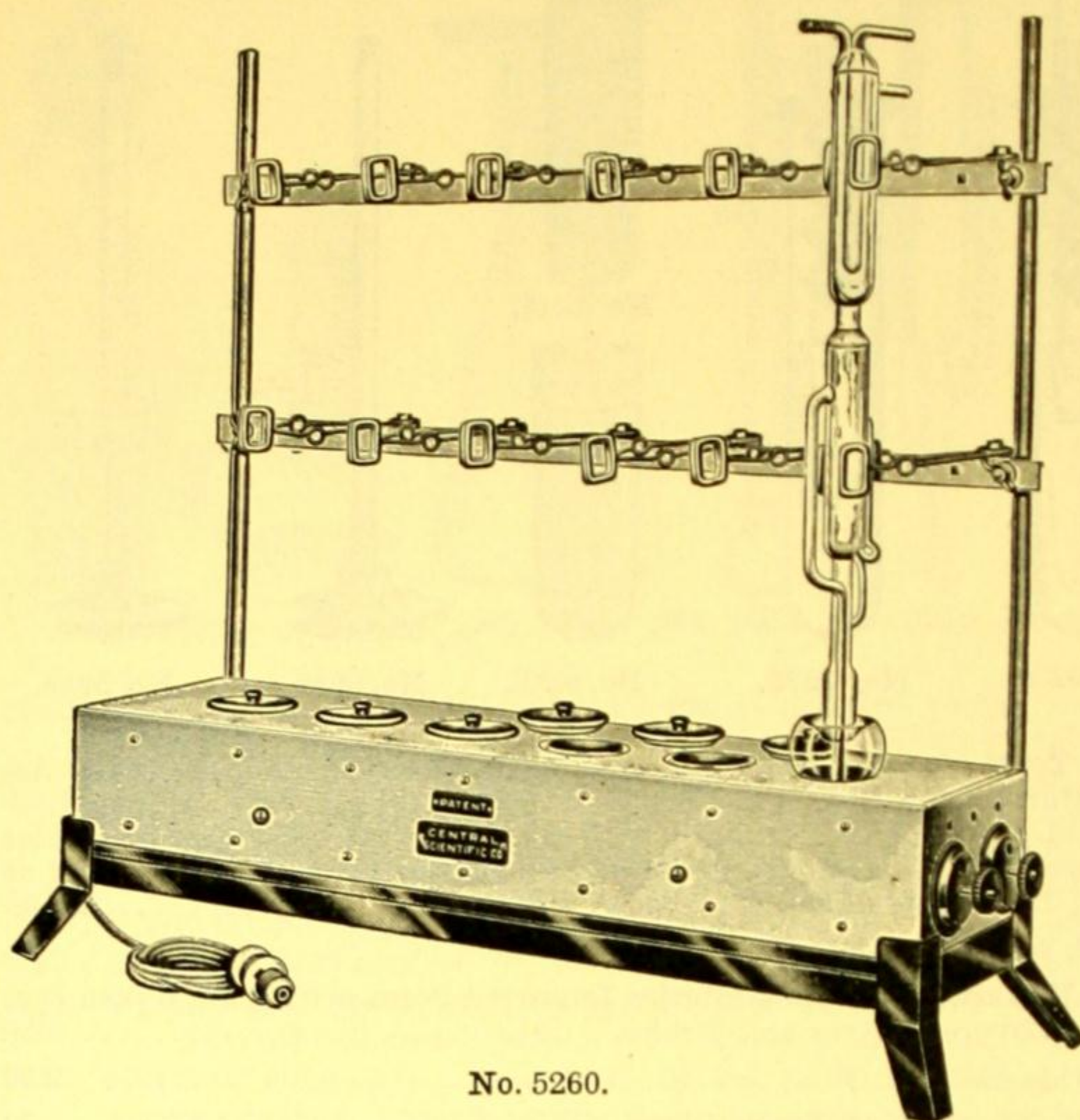
No.	Flat Bottom				Round Bottom	
	A	B	C	D	E	F
Length, mm.....	55	70	80	90	100	127
Diameter, mm.....	35	25	30	19	34	45
Each	.80	.70	.75	.60	.90	1.00

5249. **EXTRACTION THIMBLES, Seamless**, made from the same material as first grade Analytical Filter Papers and rendered fat-free by a special chemical process. Can be used repeatedly.

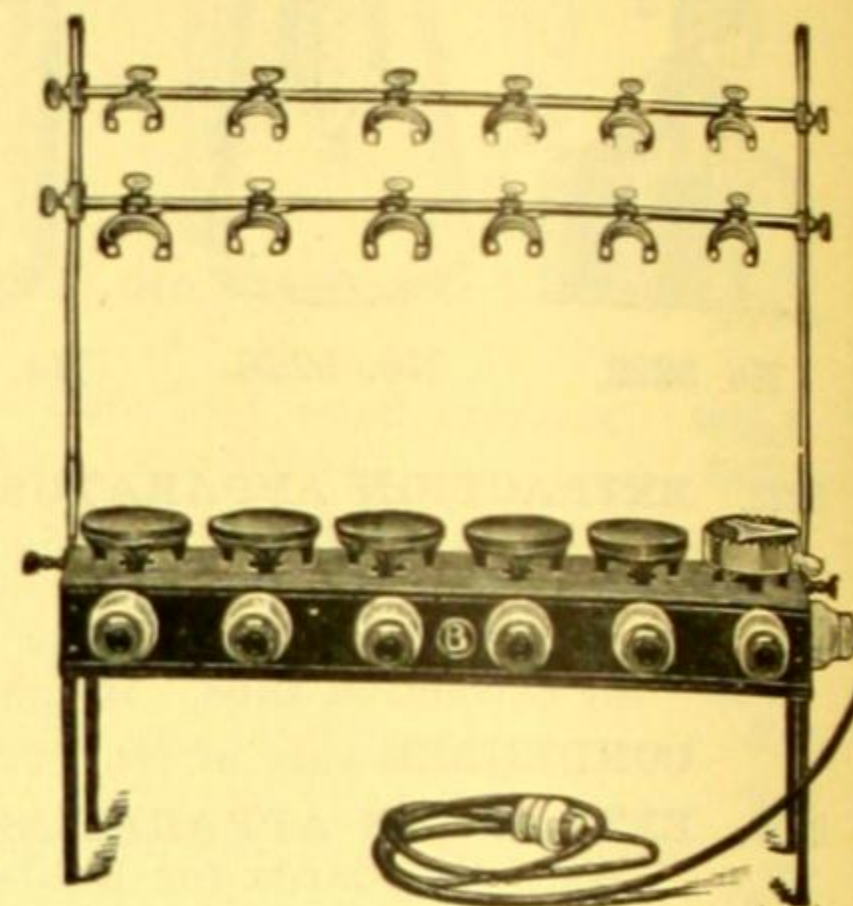
No.	A	B	C	D	E
Length, mm.....	90	80	80	94	123
Diameter, mm.....	19	22	33	33	43
Per box of 25.....	3.15	3.15	3.55	4.40	7.10

5255. **EXTRACTION APPARATUS, Röhrig**, for the determination of fat in milk and dairy products, by the Roesse-Gottlieb Method, adopted by the Association of Official Agricultural Chemists. With side-tube and stop-cock for withdrawing solvent. Unstoppered and ungraduated. On wooden base. (See Association of Official Agricultural Chemists "Methods of Analysis", 1920 edition, page 227)..... 3.50

5256. **EXTRACTION APPARATUS, Biesterfeld modification of the Röhrig Tube**, for the estimation of fat in condensed milk and milk powders by modified Roesse-Gottlieb method. (See Journal of Industrial and Engineering Chemistry, Vol. IX, No. 12, for Dec., 1917, page 1111) 4.00



No. 5260.



No. 5264.

EXTRACTION APPARATUS HEATERS

5260. **EXTRACTION APPARATUS HEATERS, Cenco Electric**, suggested by W. H. Ross, consisting of a box of asbestos board (transite) 80x20x12 cm, across the bottom of which are placed longitudinally six heating coils of resistance wire. A galvanized iron shelf or pan, placed just above the heating coils, entirely closes off the heating chamber and prevents any possibility of ignition of inflammable vapors by the heating coils. The asbestos board top, which is removable and is reinforced with angle iron to prevent warping, has six openings, 2½ inches in diameter, with removable covers, for extraction flasks. By means of two multiple-point snap switches, the six coils may be connected consecutively in the circuit as desired and varying degrees of heat obtained, which will permit the use of any solvent whose boiling point does not exceed that of water. By removing the top, the extraction flasks may be placed directly on the pan which may be used either dry as a hot plate or, filled with water, as a water bath. By supporting the flasks above the openings in the top, the instrument becomes a hot-air bath. Nickel-plated end support rods are provided with cross rods easily adjustable in height, equipped with wire spring clamps for holding the extraction tubes, which can be opened with one hand. Any type of extraction apparatus may be used with this heater, as all parts are adjustable.

Specifications

Length over all, including legs, inches.....	34	(86 cm)
Height to top of box, inches.....	9	(23 cm)
Height to top of support rods, inches.....	36½	(92 cm)
Diameter of holes, inches.....	2½	(6.4 cm)
Power consumption, maximum, watts.....	800	

Complete as described with receptacle, five feet of connecting cord and separable plug for attachment to any lamp socket.

No.	A	B
For volts	110	220
Each	\$90.00	90.00

- 5264A. **EXTRACTION APPARATUS HEATER, Electric**, similar to No. 5260, but with individual hot plates for the different flasks. As each hot plate has its own switch, any one or all may be used at one time, as desired. Length, 24 inches; width, 5½ inches; height to top of hot plate, 9 inches; diameter of hot plates, 3½ inches. With six hot plates for 110 volts..... 110.00



No. 5276.



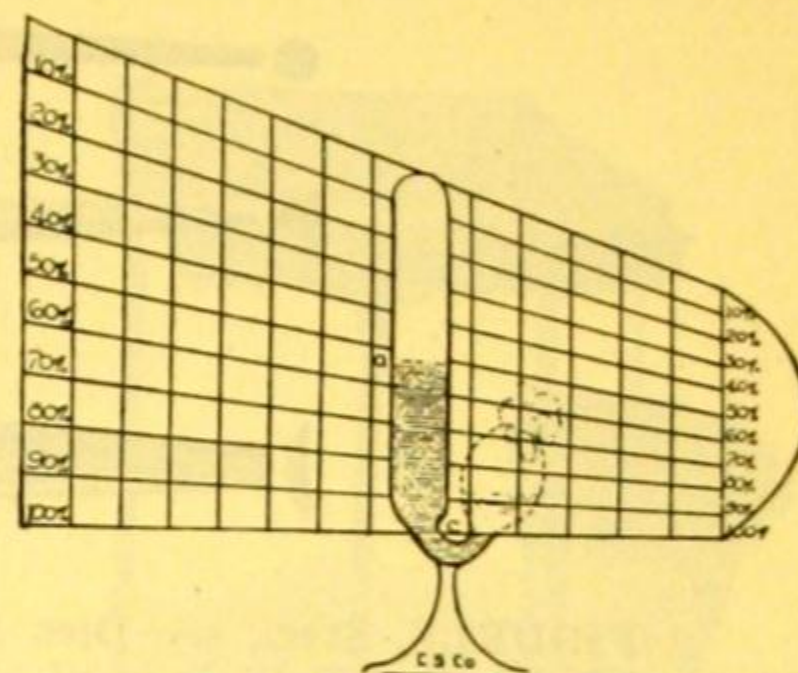
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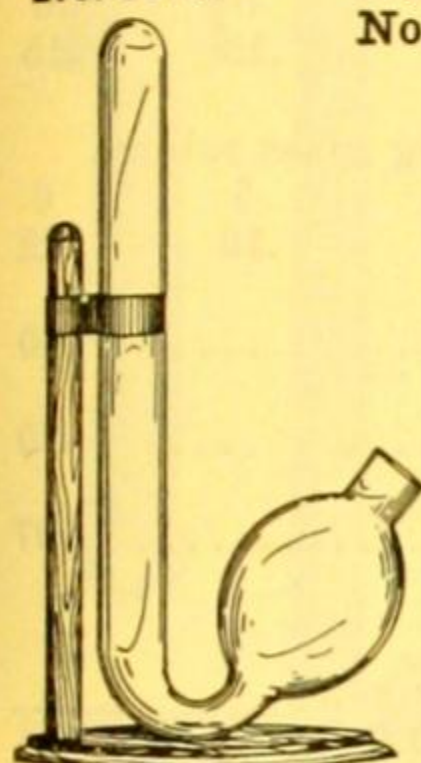
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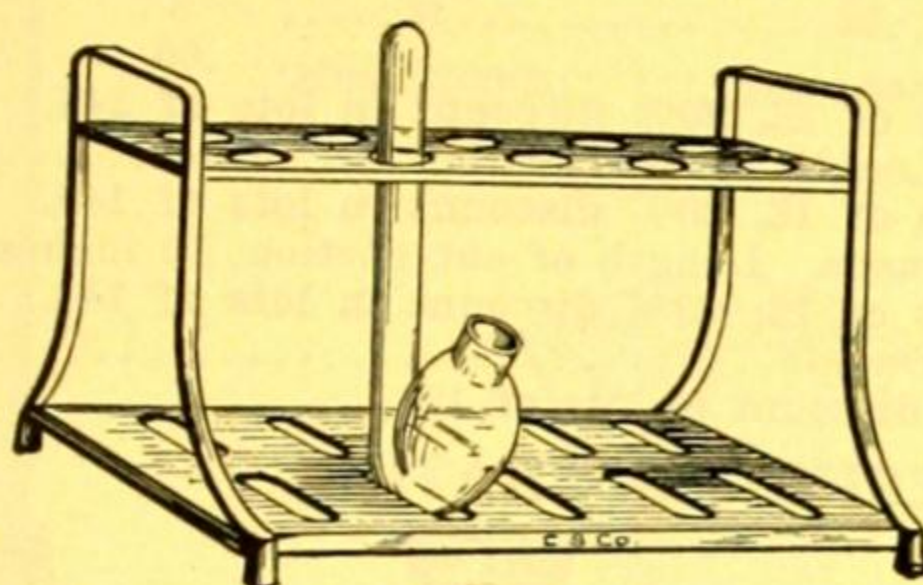
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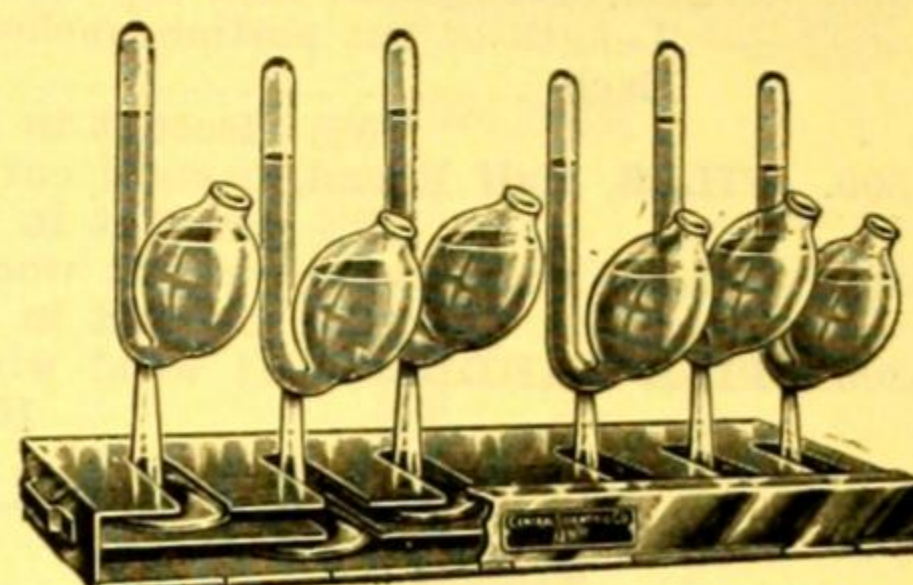
No. 5284 (Shown in Use).



No. 5290.



No. 5292.



No. 5294.

HOT PLATES, Electric, for extraction apparatus, see general heading **Hot Plates, Electric**.
FAUCET CONNECTIONS, see **Hose Connections**.

5276. **FERMENTATION TUBE**, Durham, consisting of a 6x $\frac{3}{4}$ inch (150x18 mm) test tube in which is inverted a 2x $\frac{1}{4}$ inch (50x6 mm) tube. (See Durham "A New Method for Demonstrating the Production of Gas by Bacteria," British Medical Journal for 1898, page 1387.)
Per dozen

5278. **FERMENTATION TUBES**, Smith's, on glass foot. \$0.55

No.	A	B
Length of closed tube, mm.	115	140
Diameter of closed tube, mm.	12	15
Each	.35	.40

10% discount in lots of 12.

5280. **FERMENTATION TUBES**, Smith's, without glass foot.

No.	A	B
Length of closed tube, mm.	115	140
Diameter of closed tube, mm.	12	15
Each	.16	.25

10% discount in lots of 12.

5282. **FERMENTATION TUBES**, same as No. 5280, but without bulb.

No.	A
Length of closed tube, mm.	125
Diameter of closed tube, mm.	12
Each	.16

10% discount in lots of 12.

5284. **CHART**, Frost's Gasometer, for measuring gas in fermentation tubes.10

10% discount in lots of 12.

5286. **FERMENTATION TUBE**, Standard, as adopted by the American Public Health Association. Length of closed tube, 140 mm; inside diameter of tube, 15 mm; diameter of bulb, 38 mm. On glass foot. (See "Standard Methods of Water Analysis," 1915, page 137)50

10% discount in lots of 12.

5288. **FERMENTATION TUBE**, Standard, same as No. 5286, but without glass foot.35

5290. **FERMENTATION TUBE SUPPORT** for single tubes. Of wood with brass clip for holding tubes 1.00

5292. **FERMENTATION TUBE SUPPORT**, of metal, for holding 10 fermentation tubes. Can also be used for test tubes, ureometers, and any tubes not less than 5 inches long. 3.00

5294. **FERMENTATION TUBE SUPPORT**, Stull, designed to overcome the difficulty and breakage in handling the fragile glass-footed fermentation tubes in washing, sterilizing, filling and incubating. The support is arranged so that the feet of the two rows of tubes overlap, thus enabling more tubes to be placed in the same area on the incubator shelf. Made of heavy sheet copper with shelves and slots arranged to accommodate six tubes. With cover in place, tubes can be handled freely without danger of breakage. Provided with handles to facilitate removal from sterilizer when hot. Dimensions 11 $\frac{1}{2}$ x3x1 inches. Without glassware. 5.00



No. 5296.



No. 5298.



No. 5300.

FIGURES, Steel, see Dies No. 3820.

5296. FILES, Rat Tail, bastard cut.

Length of cut portion, inches.....	4	5	6
Each	\$0.12	.13	.15

10% discount in lots of 12, 20% discount in lots of 144.

5298. FILES, Triangular, slim tapers, single cut, for use in the laboratory for cutting glass tubing.

Length of cut portion, inches.....	3	4	5	6
Each	.06	.08	.10	.12

10% discount in lots of 12, 20% discount in lots of 144.

5300. FILES, Half Round, bastard cut. Length of cut portion, 10 inches..... .40

10% discount in lots of 12, 20% discount in lots of 144.

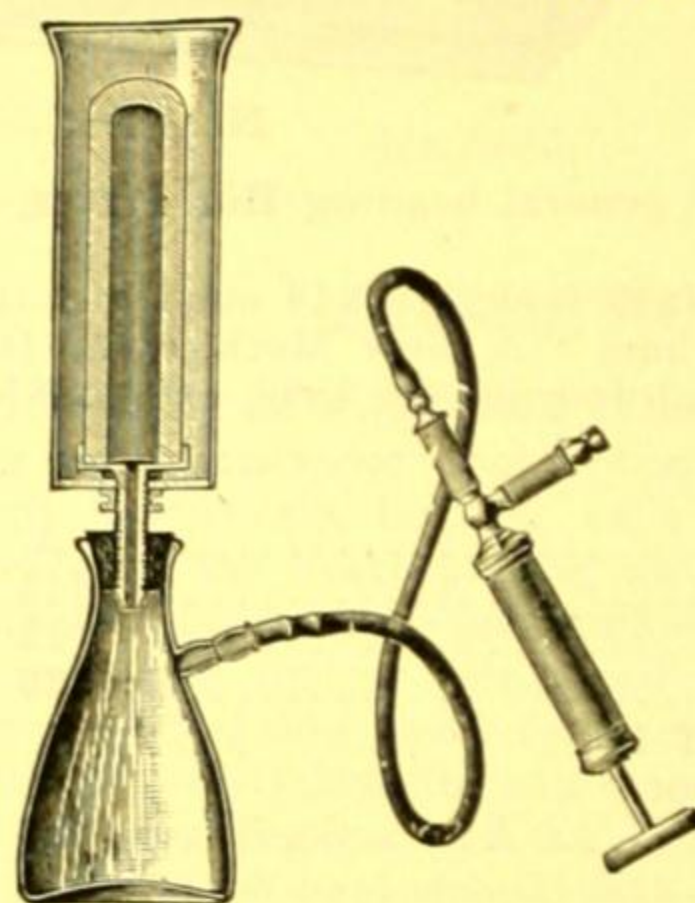
5302. FILES, Half Round, cabinet wood rasps. Length of cut portion, 10 inches..... .70

10% discount in lots of 12, 20% discount in lots of 144.

5306. FILE HANDLES, soft wood with ferrule..... .07

10% discount in lots of 12.

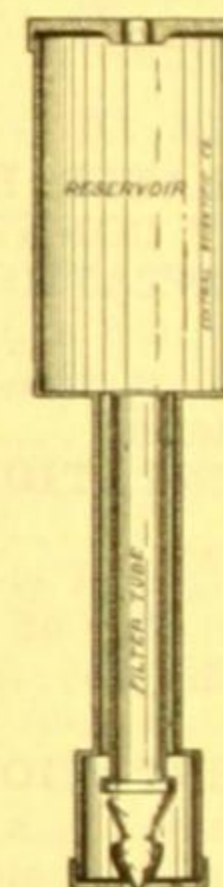
FILTERING APPARATUS



Nos. 5314-16.



Nos. 5320-2.

Nos. 5320-2.
(Cross-section.)

5314. **FILTERING APPARATUS, Berkefeld Type**, consisting of a porous cylinder fitted with metal head piece and outlet tube, and provided with glass mantle for holding liquids. Extensively used for sterilizing liquids of all kinds, filter ring serums, toxins, etc., and in separating bacteria from cultures. They should be used in connection with Filter Flasks No. 5664, attached to a filter pump or other means of exhausting air. Without flask or pump.

No.	A	B	C	D	F
Height of cylinder, inches.....	1 3/8	2 1/2	5	8	10
Diameter of cylinder, inches.....	5/8	5/8	1	1	2
Each	\$1.65	1.90	2.20	2.50	3.30

5315. **FILTERING CYLINDERS** only of No. 5314.

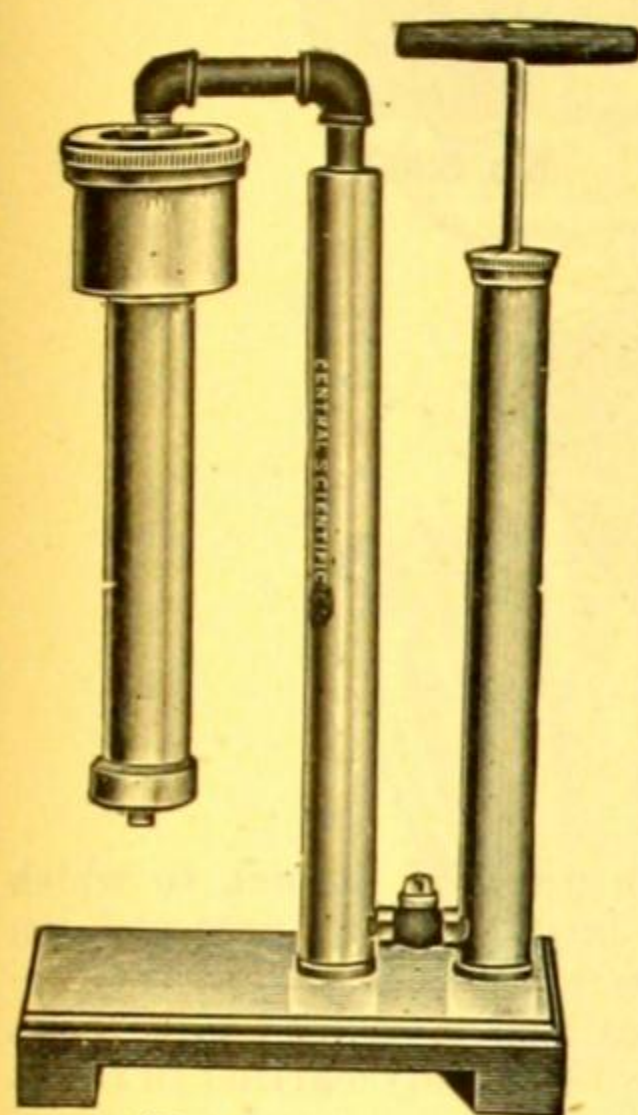
No.	A	B	C	D	F
Each	1.15	1.25	1.25	1.50	2.00

5316. **GLASS MANTLES** only of No. 5314, of Pyrex glass.

No.	A	B	C	D	E
Size, inches	2 1/2 x 1 1/4	4 3/8 x 1 1/4	6 x 2 3/4	11 x 2 3/4	13 1/4 x 4 3/8
For cylinder, No.	A	B	C	D	F
Each	.50	.65	.95	1.00	1.30

5320. **FILTERING APPARATUS for Soils, Brigg's Design**, as described in Bulletin No. 31 of the Bureau of Soils. Extensively used in the filtration of soil solutions. Can be used in filtering any solution under pressure where a clear filtrate is desired. Consists of a cylinder of brass nickel-plated on the outside and heavily plated with silver inside, fitted with a Pasteur-Chamberland filter tube of unglazed porcelain. Capacity of reservoir, approximately 800 cc. 17.00

5322. **FILTERING APPARATUS for Serums, Brigg's Design**, same as No. 5320, but with special bougie for serum filtration..... 17.75



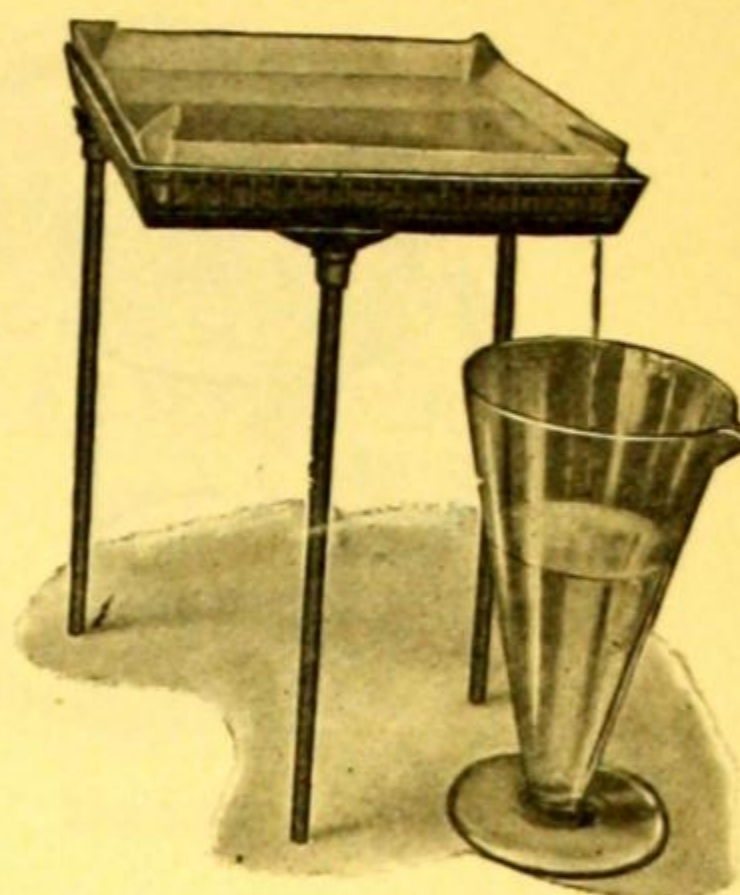
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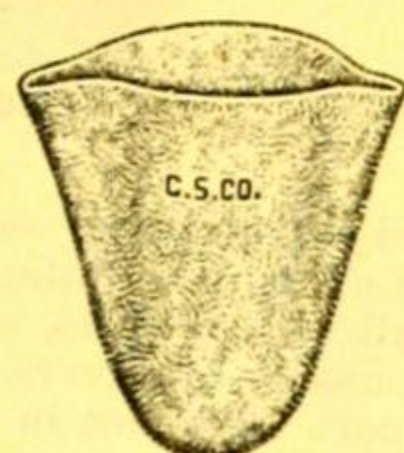
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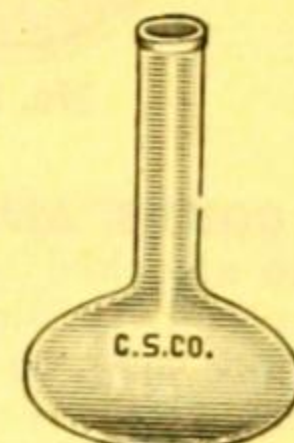
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No. 5352.

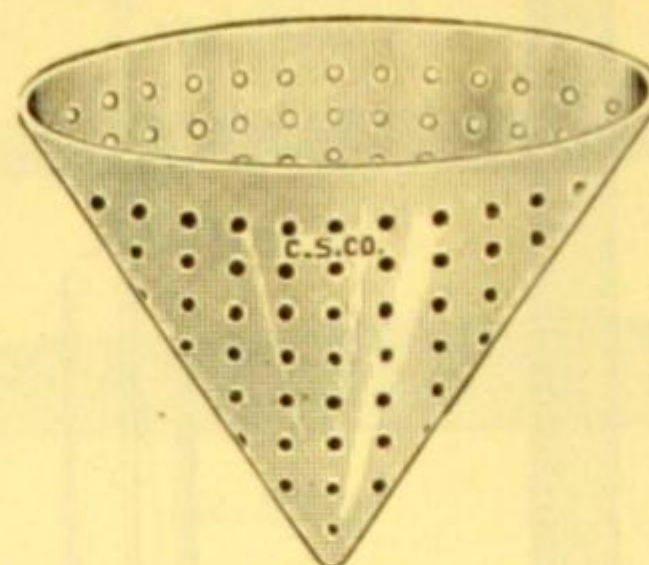


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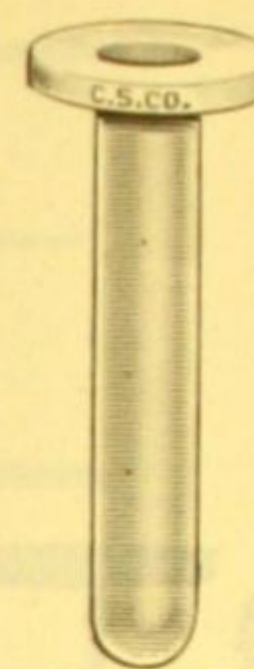
5328. **FILTERING APPARATUS** for Soils, Brigg's Design, similar to No. 5320, but complete with air pump and tank mounted on a substantial base. This makes a very convenient outfit for field use in soil investigations. Capacity of reservoir, about 250 cc. Complete as illustrated \$39.00
5330. **FILTERING APPARATUS** for Serums, Brigg's Design, same as No. 5328, but with special bougie for serum filtration..... 39.00
5340. **FILTER TUBE**, for Soils, Pasteur-Chamberland, French make, for use with Nos. 5320 and 5328. Length over all, 10 inches; diameter of unglazed cylinder, 1 inch..... 2.60
5342. **FILTER TUBE (Bougie)**, for Serums, Pasteur-Chamberland, French make, for use with Nos. 5322 and 5330..... 2.50
5346. **FILTERING APPARATUS**, Fitzgerald's Constant Level, consisting of a 300 cc glass reservoir, having a long glass rod fitted with a ground stopper for closing the lower opening when filling the apparatus. The liquid to be filtered is introduced through the opening at the side 1.50
5348. **FILTERING APPARATUS**, Tray Form, consisting of glass tray with ribbed bottom and outlet at one corner. The entire surface of the filter paper is utilized, affording four times as much filtering surface from the same sheet as in a funnel. Takes filter paper 12x12 inches. Widely used for separating liquids from impurities where the weight of the separated material is not needed. Complete with supporting tripod as shown 3.50
5349. **Filter Paper** for No. 5348 Filtering Apparatus, in sheets 12x12 inches.
 A. For rapid filtration.....per 100 sheets 3.75
 B. Heavy paper for finer work.....per 100 sheets 6.00
5352. **FILTER BAGS** of felt.
 Capacity, quarts 1 3 5
 Each 1.40 2.00 3.60
5354. **FILTER BALLOON**, Pukal, of unglazed porcelain, for filtering solutions from outside by means of a filter pump. Height, 200 mm; diameter, 125 mm; capacity, about 400 cc..... 1.98
- FILTER BOUGIES**, see **Filter Tubes** Nos. 5340 and 5342.



No. 5356.



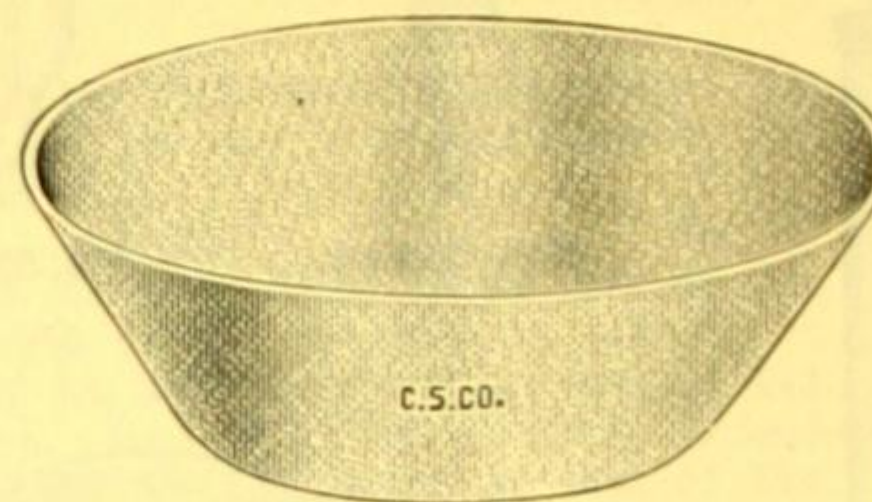
No. 5360.



No. 5362.



No. 5366.



No. 5368.

- 5356 **FILTER CONES**, Alundum, for rapid filtration by suction, for use in any 60° funnel, to which they are attached by a wide band of rubber tubing. They have a large filtering area and can be completely washed free from all soluble salts, as the entire filtering area is within the funnel. They may be completely cleansed by reverse washing and ignition, and used repeatedly. Complete with wire stand for support when not in use. Medium porosity only carried in stock. Fine and coarse porosities can be supplied on short notice.

No.	A	B	C	D
Capacity, cc.....	20	50	60	100
Diameter, inches	1 3/4	2 1/2	3	4 1/2
Height, inches	1 5/16	1 7/8	2 7/16	3 1/2
Each	\$0.30	.60	.85	1.50

5357. **Rubber Gaskets** for use with No. 5356. No. A B C D
For filter cone, cc..... 20 50 60 100
Each05 .05 .08 .10

5360. **FILTER CONE**, Best American Porcelain, glazed throughout except rim, with holes about 1.5 mm in diameter.

No.	3
Diameter, mm.....	50
Length of side, mm.....	43
Each	1.08

5362. **FILTER CYLINDER**, Best American Porcelain, unglazed, with flange, for filtering solutions by means of a filter flask. Length, 115 mm; diameter inside, 16 mm; diameter outside, 20 mm; diameter of flange, 50 mm..... .96

5366. **FILTER DISCS**, Perforated, Best American Porcelain, with beveled edge, glazed with exception of edge and bottom. Diameter of perforations, 1 mm.

No.	3	4	6	7
Diameter, mm	22	25	38	50
Thickness, mm	2	3.5	4	4
Each	.24	.24	.36	.46

5368. **FILTER DISHES**, Alundum, to fit the top of a glass funnel, for rapidly filtering large amounts of material. Especially adapted for organic work. Filters thoroughly, quickly and without previous preparation. Medium porosity carried in stock. Fine and coarse porosities can be supplied on short notice.

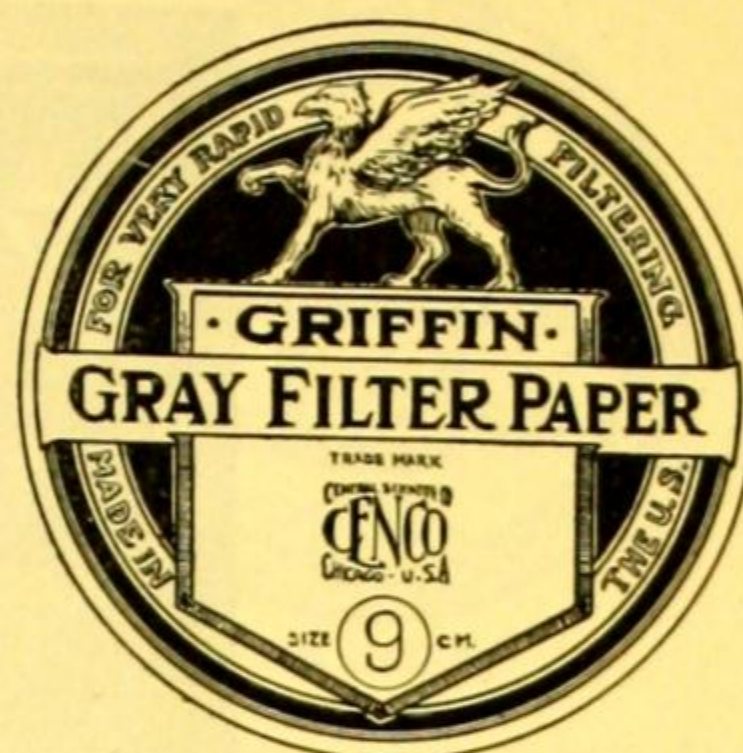
No.	A	B	C
Diameter, inches	5 5/8	4	2 1/2
Depth, inches.....	2	2	1
Capacity, cc.....	400	300	50
Each	2.00	1.25	.90

5369. **Rubber Gasket**, molded shape, for No. 5368A, 400 cc..... .50

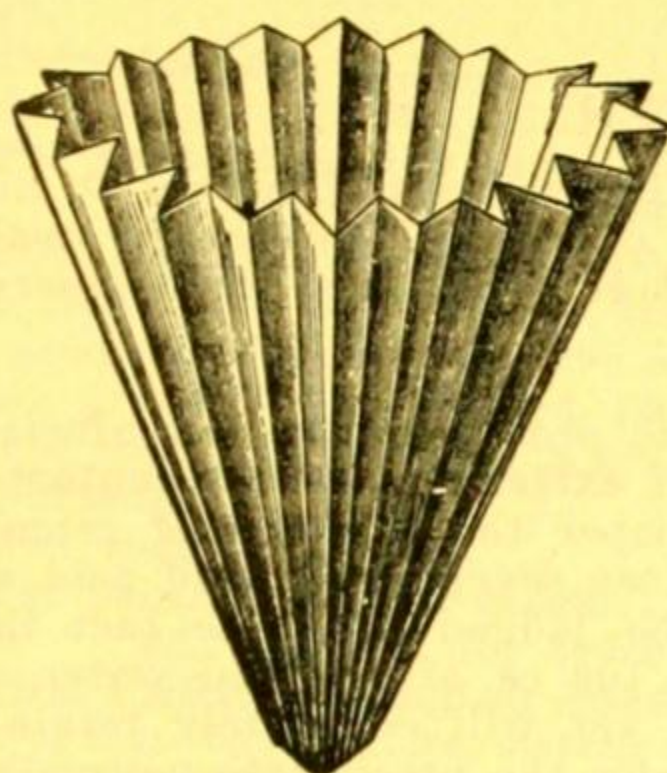
FILTER FLASKS, see No. 5664.



No. 5380.



No. 5390.



No. 5398.



No. 5400.

FILTER PAPER

5380. **FILTER PAPER, Cenco**, for qualitative work, a pure white paper with smooth surface. This paper has been in use for several years in many of the large University and industrial laboratories, where it has proved entirely satisfactory for qualitative work because of its speed, wet strength, retentiveness and freedom from mineral impurities. Cut in round filters and put up in packages of 100 sheets with band and covers.

Diameter, cm	7.5	9	11	12.5	15	20	25	33	40	45	50
Per package of 100 sheets.	\$0.10	.11	.15	.16	.22	.35	.55	.80	1.25	1.50	1.90

10% discount in lots of 10 pkgs., 20% discount in lots of 100 pkgs.

FILTER PAPER, Cenco, same quality as No. 5380, in sheets 20x20 inches (50x50 cm).

5381A. Per quire	.50
5381B. Per ream	7.25

5390. **FILTER PAPER, Griffin Gray**, a strong unusually rapid creped paper of uniform quality. Extensively used in the drug trade and for filtering sugar solutions.

Diameter, cm	10	12.5	15	20	25	33	40
Per package of 100 sheets.	.16	.21	.28	.42	.60	.78	1.20

20% discount in lots of 100 pkgs.

FILTER PAPER, Griffin Gray, same as No. 5390, in sheets 20x20 inches (50x50 cm).

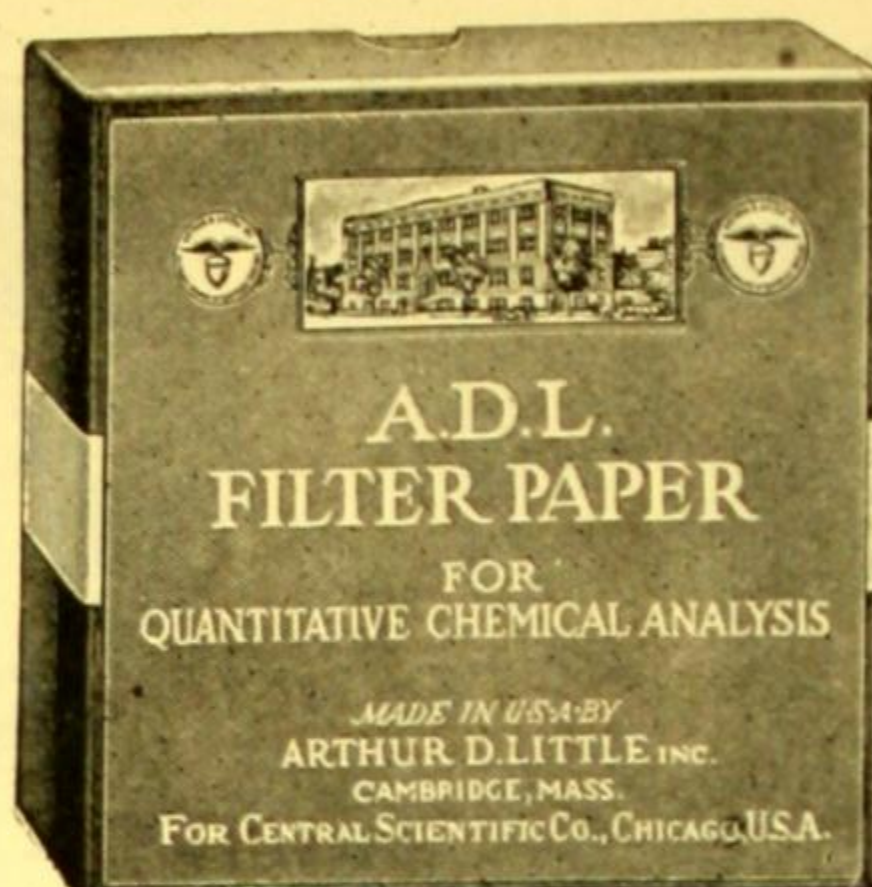
5391A. Per quire	.50
5391B. Per ream	7.60

5398. **FILTER PAPER, Chardin, for Agar Agar**. The filters are folded and packed in boxes.

Diameter, cm	32	50
Number in box	50	25
Per box	2.00	2.00

5400. **FILTER PAPER, Folded, S. & S. No. 588**, excellent quality, free from chlorine and acids. Folded in such a way as to protect the points from tearing. Especially adapted to pharmaceutical and technical work on account of their rapidity, due to the amount of surface utilized. In boxes of 100 filters.

Diameter, cm	12.5	15	18.5	24	32
Per box of 100	.80	1.00	1.20	1.80	2.80



No. 5402.

A. D. L. FILTER PAPER

After some years of experimental and research work, the laboratories of Arthur D. Little, Inc., of Cambridge, Mass., have perfected a process of manufacture of double-acid-washed analytical filter paper resulting in a product for general quantitative work whose established merit deserves the most careful consideration.

Special Features

A. D. L. Filter Paper is the only paper made, in the entire process of the manufacture of which only distilled water is used. As a result a clear white paper of **extremely low ash content** is produced.

The manufacturers have succeeded in combining in one paper the qualities of retentiveness and speed, making it unnecessary for the chemical laboratory to keep several grades of acid washed paper for their various analytical separations. Their success may be judged from the fact that A. D. L. paper has a penetrability lying between 15 and 25 seconds for 100 cc of distilled water, as compared with speeds of 10 to 120 seconds for other low ash papers, and yet will completely retain barium sulphate even when precipitated under conditions such as to render the precipitate unusually fine. (For method of determining penetrability, see Journal of Industrial and Engineering Chemistry, Vol. XIV, No. 3 for March, 1922, page 199.) A. D. L. paper is **faster than any other paper of equal retentiveness**.

The tensile strength (wet) of A. D. L. paper is unusually high, being, in fact, **greater than that of any equally rapid paper** which has been tested. This makes it suitable for use in Buchner funnel work and eliminates the necessity for a specially treated paper for this purpose, except for determining crude fibre.

The rigid inspection of the finished paper employed by the manufacturers insures that only perfect paper reaches the consumer. No other paper must pass such a rigid examination of each circle before being put up in boxes. As a result a **uniformity is attained, not found in other papers**.

DETAILS OF LABORATORY TESTS

A sample of paper is taken for laboratory tests from every 20 pounds as it comes from the machine. The laboratory tests made on these samples as well as the limits for such tests are as follows:

Penetrability	15-25 seconds
Retention of BaSO ₄	Excellent
Ash	0.008%
Ash per 11 cm circle	0.00006 gram
Thickness, inch	0.0070-0.0090
Bursting strength, lbs. per sq. in.	12 minimum

(a) Penetrability

The figure for penetrability is obtained upon the "Little" tester and represents the number of seconds which is required for 100 cc of water to pass through a 2-inch circle of the paper under a constant 9-inch head. 25 seconds represents the maximum penetrability figure which is obtained. On the other hand many runs of paper show a penetrability faster than 15 seconds. The penetrability of the fastest papers on the market (which are not intended to hold BaSO₄) is about 10 seconds.

(b) Retention of BaSO₄

In making this test the barium sulphate is always precipitated under the same conditions, and in such a manner as to give a much finer precipitate than would ordinarily be obtained in good practice. No paper passes the laboratory tests which will not hold the precipitate formed under these unusually severe conditions.

(c) Thickness and Bursting Strength

While the thickness figure is not used as a basis for acceptance or rejection, yet an effort is made to hold the paper within the above limits and the constant checking of the thickness aids in making a uniform paper. Most of the paper shows a bursting strength of approximately 15 pounds per square inch. This test has a direct bearing upon the resistance of the paper to the ordinary handling. It has been found that the bursting strength of A. D. L. paper is somewhat higher than that of most other papers which are intended to be used for general laboratory work.

(d) Physical Inspection

The paper which has passed the specifications of the laboratory tests is then cut into circles of various sizes and every circle submitted to physical inspection. No paper passes this inspection which shows pin holes or thin spots, when placed over a 50-watt incandescent lamp. No paper passes this inspection which shows objectionable dirt specks. Furthermore, all paper is thrown out on this inspection which presents an unsightly appearance on account of ragged edges, etc. Other papers which are at present on the market have been subjected to this inspection and as high as 30% of some of them would be rejected by the A. D. L. standard.

5402. **FILTER PAPER, A. D. L.**, as described above, in sealed boxes of 100 circles.

Size, cm	7	9	11	12.5	15
Ash weight, grams	.000024	.00004	.00006	.00008	.00011
Per box of 100 circles	1.20	1.70	2.00	2.30	2.70

5% discount in lots of 10 pkgs., 10% discount in lots of 100 pkgs.



No. 5403.



No. 5407B.

5403. **FILTER PAPER, Munktell Swedish, No. 00**, a double acid washed paper with the lowest ash content of any analytical paper made. This is said to be due to the natural purity of the water used in its manufacture, while the peculiar character of the climatic conditions accounts for its superior texture. Put up in birch-bark boxes, containing five packages of 100 circles each.

Diameter, cm	9	11
Ash weight, grams	.00003	.000045
Per package of 100 sheets	\$1.92	2.40

5% discount for orders of assorted sizes amounting to \$100.00 or above.

5404. **FILTER PAPER, Munktell Swedish, No. 0**, a single-acid (hydrochloric) washed paper of low ash content, widely used in the analysis of iron ore. It is quite rapid, but retentive, and can be used satisfactorily for the filtration of Ammonium Phospho-Molybdate, Barium Sulphate when properly precipitated, and for general quantitative work in which the lowest ash weight is not required. Put up in birch-bark boxes containing five packages of 100 circles each.

Diameter, cm	9	11	12.5
Ash weight, grams	.00017	.00025	.00033
Per package of 100 sheets	1.00	1.32	1.51

5% discount for orders of assorted sizes amounting to \$100.00 or above.

5405. **FILTER PAPER, Munktell Swedish, No. 0B**, a single-acid washed paper similar to No. 5404, but of more open texture, making it more rapid. It will retain the finest precipitates and because of its rapidity is preferred by some industrial laboratories to any other paper for analytical work.

Diameter, cm	9	11
Ash weight, grams	.00024	.00035
Per package of 100 sheets	1.15	1.51

5% discount for orders of assorted sizes amounting to \$100.00 or above.

5406. **FILTER PAPER, Munktell Swedish, No. 1 F**, an unwashed paper, with less ash than any other similar paper made. Very strong and close in texture, retaining the finest precipitates. Extensively used in tanning laboratories in the determination of soluble solids, non-tannins, etc.

Diameter, cm	9	11	12.5	15	18.5
Ash weight, grams	.00038	.00056	.00073	.00105	.00160
Per package of 100 sheets	.60	.72	.96	1.20	1.80

5% discount for orders of assorted sizes amounting to \$100.00 or above.

- 5407A. **FILTER PAPER, S. & S. No. 595**, with plain surface. This is a good light paper made of the best material, filtering quite rapidly. 100 cc of water will pass through a 15 cm filter in 50 to 80 seconds. Free from chlorine. Put up in packages of 100 sheets.

Diameter, cm	9	11	12.5	15
Per package of 100 sheets	.24	.28	.30	.51

- 5407B. **FILTER PAPER, S. & S. No. 597**, similar to No. 5407A, but a stronger, more retentive and consequently less rapid paper. 100 cc of water will pass through a 15 cm filter in 80 to 100 seconds. This is the standard grade for qualitative analytical work.

Diameter, cm	9	11	12.5	15
Per package of 100 sheets	.34	.42	.52	.74

- 5408A. **FILTER PAPER, S. & S. No. 589¹**, Black Ribbon, washed with hydrochloric and hydrofluoric acid to reduce the ash weight for quantitative use. This is the most rapid of the S. & S. papers, due to its loose texture. It should be used for larger grained precipitates which do not readily pass through the pores of the paper, such as Silica, Iron, Aluminum and similar materials. It should not be used for Barium Sulphate. Especially useful in Cement and Metallurgical Laboratories.

Diameter, cm	9	11
Ash weight, grams	.00011	.00017
Per package of 100 sheets	1.70	2.00

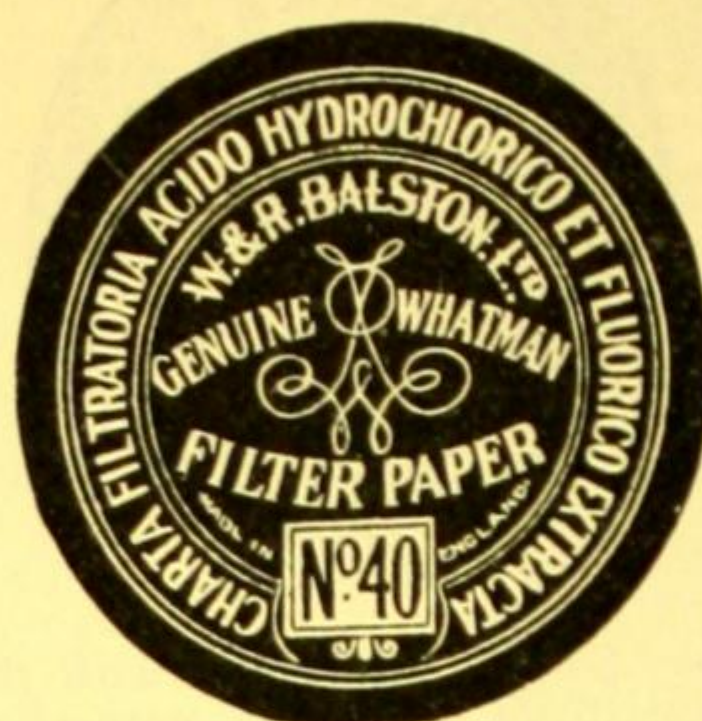
- 5408B. **FILTER PAPER, S. & S. No. 589²**, White Ribbon, similar to No. 5408A, but stronger and closer in texture, retaining all ordinary analytical precipitates. This is the standard grade for quantitative analytical work. Not so rapid as No. 5408A.

Diameter, cm	9	11
Ash weight, grams	.00011	.00017
Per package of 100 sheets	1.70	2.00

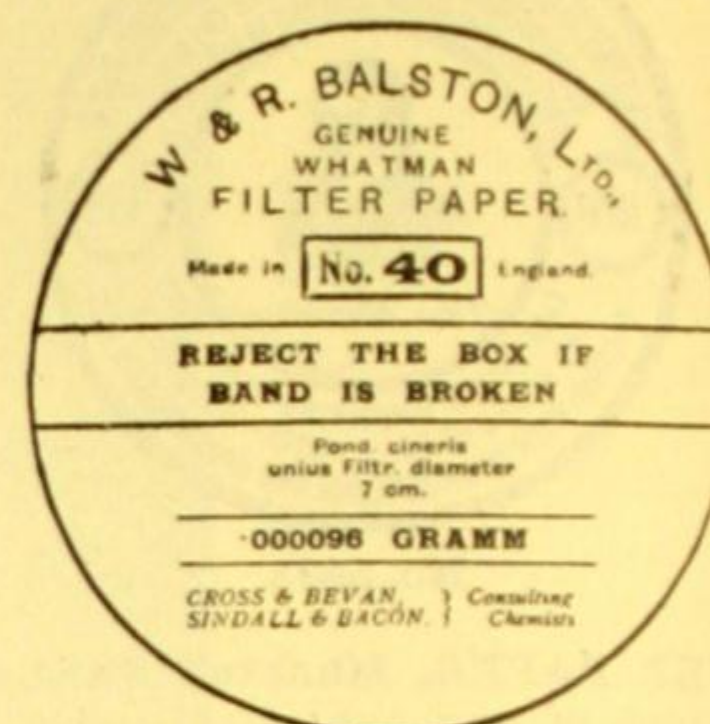
5409. **FILTER PAPER, S. & S. No. 575**, hardened filters, for use with the filter pump. This paper has been specially treated to produce a tough smooth surface which clings closely to the sides of the funnel and will resist, when moist, a pressure of 2 to 3 atmospheres (29 to 44 pounds per square inch). It is very durable even after continued use and precipitates may be scraped from it without destroying its surface, so that one sheet may be used for several filtrations. Corrosive liquids such as solutions of Stannous Chloride, Antimony Chloride, Acids and Alkalies may be filtered satisfactorily with this paper.

Diameter, cm	7	9	11
Per package of 100 sheets	1.20	1.70	2.00

WHATMAN FILTER PAPER



No. 5438.



No. 5438 (Reverse Side).

WHATMAN FILTER PAPERS were developed during the war by Messrs. W. & R. Balston, Ltd., of England, the manufacturers of the well known Whatman Drawing Paper.

The acid-washed papers come packed in well-made cardboard boxes, carefully labelled and sealed to prevent handling, each box containing 100 circles. The qualitative papers are in packages of 100 circles, wrapped in bundles containing 10 packages.

The grades listed below offer an assortment from which we believe one may select a paper suitable to any type of analytical work. For convenience, we give the number of the Schleicher & Schuell, Dreverhoff or Munktell paper corresponding to each Whatman number.

QUANTITY PRICES.

Upon orders amounting to less than \$100.00 list	Net.
Upon orders from \$100.00 to \$200.00 list.....	5%
Upon orders above \$200.00.....	10%
(Orders may be assorted as to kinds and sizes, but must be placed at one time.)	

5410. **FILTER PAPER, Whatman No. 1 (S. & S. No. 595)**, a high grade rapid filter paper for general qualitative work and for filtering ordinary precipitates when the ash weight of the paper is of no consequence. Widely used in Sugar Laboratories and for the filtration of yellow Ammonium Phospho-Molybdate after digestion, in determining phosphorus in fertilizers.

Diameter, cm.	9	11	12.5	15	18.5
Ash weight per circle, grams.....	.00076	.0011	.0016	.0021	.0032
Per 100 circles.....	\$0.24	.28	.37	.51	.71

FILTER PAPER, Whatman No. 1 (S. & S. No. 595), same as No. 5410, but in sheets, 46.5 x 57 cm.

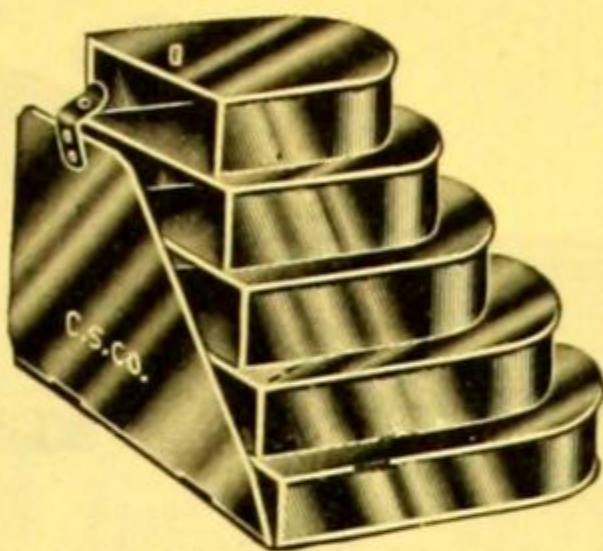
5411. Per 100 sheets..... 4.45
5412. Per ream (500 sheets)..... 20.25

5414. **FILTER PAPER, Whatman No. 2 (S. & S. No. 597)**, a qualitative paper similar to No. 1, but stouter, retaining fine precipitates. This is the standard grade for analytical purposes. Widely used in the qualitative analysis of the alkaline earths, and in general where fine precipitates of crystalline nature are to be filtered. Especially applicable to Fertilizer, Cement, Steel, and Ore Analysis.

Diameter, cm.	9	11	12.5	15
Ash weight per circle, grams.....	.0012	.0018	.0024	.0034
Per 100 circles.....	.34	.42	.52	.74

5420. **FILTER PAPER, Whatman No. 4 (S. & S. No. 604)**, a soft paper of more open texture than the preceding. Extremely rapid, but not recommended for use with the finest precipitates. Especially adapted for the rapid filtration of gelatinous and large particle precipitates such as Ferric Hydroxide and Aluminum Hydroxide; also useful for Pharmaceutical purposes, such as the filtration of fruit juices, syrups, oils, etc. Widely used in Copper and other Ore Mining, Sugar and Cement Laboratories.

Diameter, cm.	9	11	12.5	15
Per 100 circles.....	.40	.50	.65	.90



No. 5462.

5430. **FILTER PAPER**, Whatman No. 30 (Dreverhoff No. 207; Munktell No. O), a single-acid washed paper of low ash content, rapid and retentive. Very satisfactory for the filtration of Ammonium Phospho-Molybdate, Barium Sulphate when properly precipitated, for volumetric Lime determinations and for general quantitative work when the lowest ash is not important. Extensively used in Cement and Metallurgical Laboratories.

Diameter, cm.	9	11
Ash weight per circle, grams.....	.0002	.0003
Per 100 circles.....	\$0.90	1.20

5438. **FILTER PAPER**, Whatman No. 40 (S. & S. No. 589², White Ribbon), a double-acid-washed paper of very low ash, all mineral matter having been removed by treatment with hydrochloric and hydrofluoric acids. Filters rapidly and retains fine precipitates. This is the standard double-washed grade for analytical purposes. Excellently suited for Barium Sulphate when properly precipitated and filtered hot, also for Lead Sulphate, and for crystalline precipitates, such as Magnesium-Ammonium Sulphate, etc.

Diameter, cm.	7	9	11	12.5	15
Ash weight per circle, grams.....	.00005	.000082	.00012	.00016	.00023
Per 100 circles.....	1.20	1.70	2.00	2.30	2.70

5440. **FILTER PAPER**, Whatman No. 41 (S. & S. No. 589¹, Black Ribbon), a double-acid-washed paper similar to No. 40, but more open in texture and therefore filters more rapidly. Suitable for Iron, Aluminum, and other gelatinous precipitates which can be filtered quickly and washed rapidly and easily. Widely used in determining Silicon in Iron and Steel Analysis.

Diameter, cm.	7	9	11	12.5	15
Ash weight per circle, grams.....	.00005	.000082	.00012	.00016	.00023
Per 100 circles.....	1.20	1.70	2.00	2.30	2.70

5442. **FILTER PAPER**, Whatman No. 42 (S. & S. No. 589³, Blue Ribbon), a double-acid-washed paper, similar to No. 40, but much harder and extremely close in texture. On account of its close texture it is recommended for use with the filter pump and as folded filters where possible. Especially adapted for the finest precipitates which tend to pass through the filter paper, such as Barium Sulphate when precipitated in cold solution, and in general for precise analytical work where speed is not important.

Diameter, cm.	7	9	11	12.5	15
Per 100 circles.....	1.20	1.70	2.00	2.30	2.70

5446. **FILTER PAPER**, Whatman No. 44 (S. & S. No. 590), a double-acid-washed paper of thinner substance and lower ash content than the preceding numbers. It will retain the finest precipitates, but is slightly slower in filtration than No. 40. No. 44 is recommended for use when the greatest possible degree of accuracy in quantitative work is required.

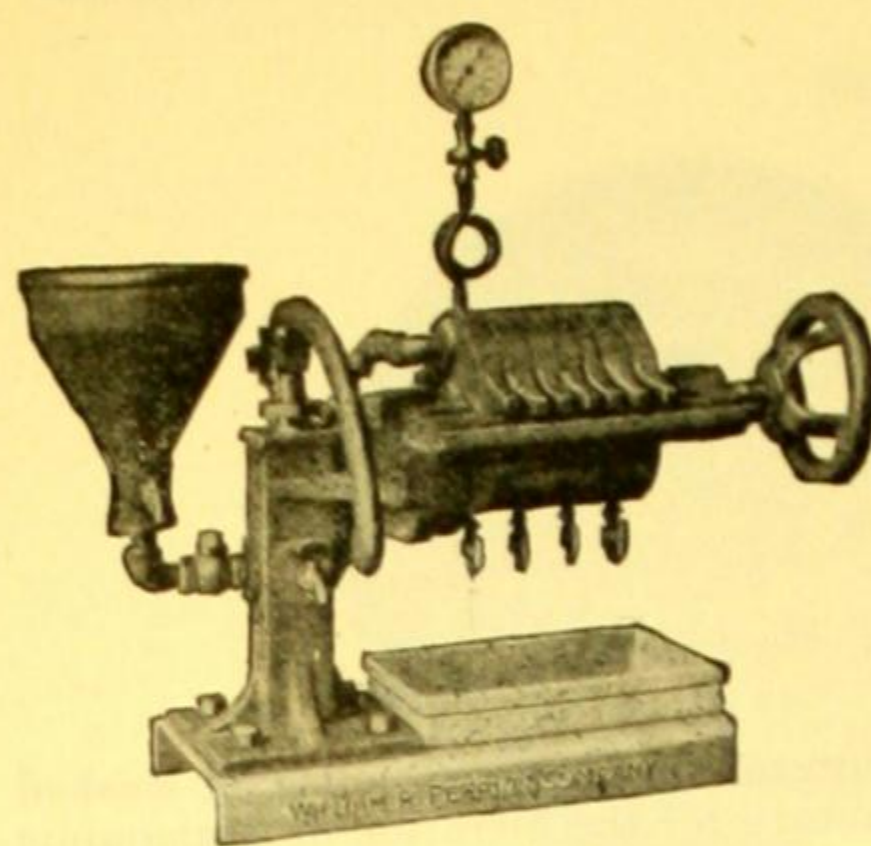
Diameter, cm.	9	11
Ash weight per circle, grams.....	.00005	.000077
Per 100 circles.....	2.20	2.55

5452. **FILTER PAPER**, Whatman No. 50 (S. & S. No. 575), a paper specially hardened by treatment with Nitric Acid. Very tough, will resist great pressure, and retain the very finest precipitates. Can be used repeatedly, the hard smooth surface permitting precipitates to be scraped or washed off without injury to the paper. Especially recommended for use with vacuum. Suitable for very fine precipitates and for filtering corrosive liquids such as Acids and strong Alkalies. Should be used when it is desired to transfer a precipitate without ignition. Widely used for filtering Biological products, as the hardened surface prevents contamination of the filtered product by particles of paper when scraped off. Can be used as a substitute for platinum cones, and as supports for large folded filters to prevent them bursting at the points.

Diameter, cm.	7	9	11	12.5	15	18.5	24
Per 100 circles.....	1.20	1.70	2.00	2.30	2.70	3.60	6.10

For Quantity Discounts, see Page 230.

5462. **FILTER PAPER CASE**, of japanned tin, convenient for holding filters of different sizes. Will take 6 sizes from 7.5 cm to 18.5 cm in diameter 4.00



No. 5468.

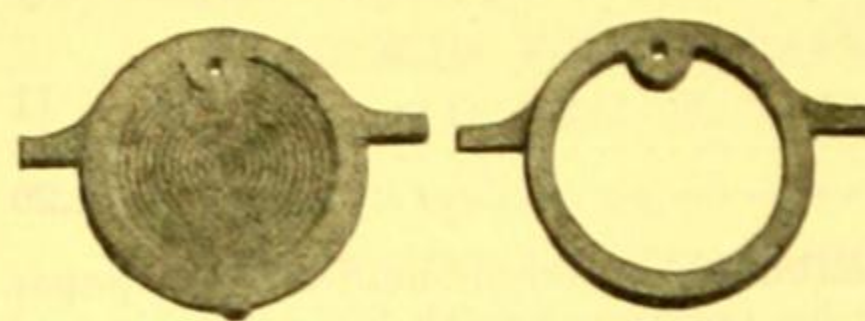
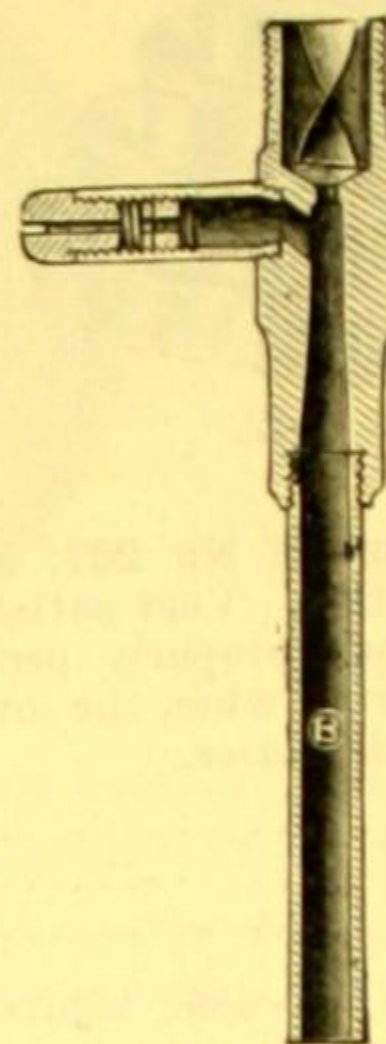
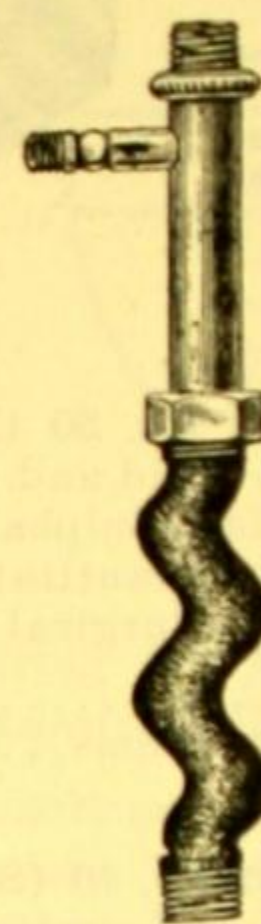


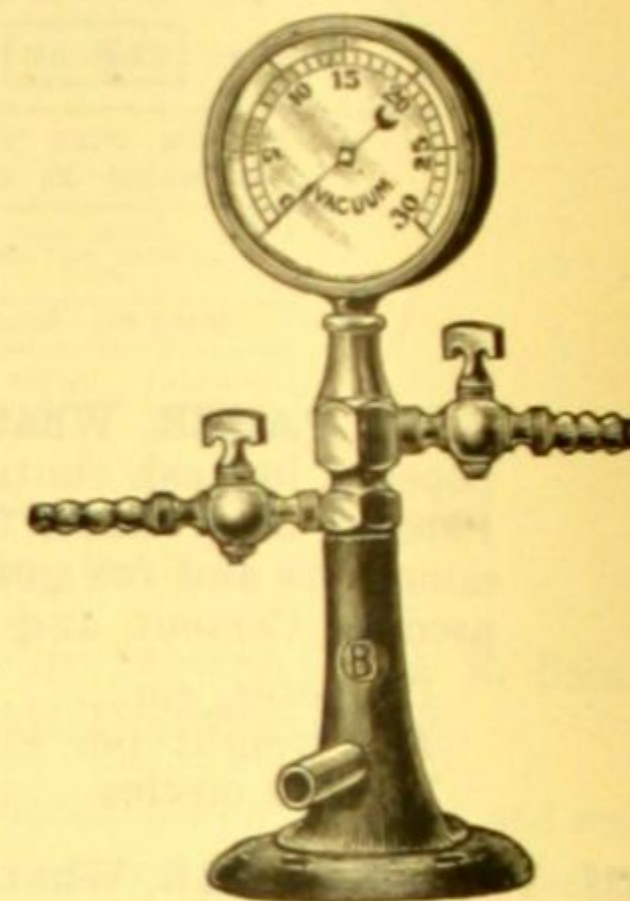
Plate and Frame of No. 5468.



No. 5476.



No. 5478.



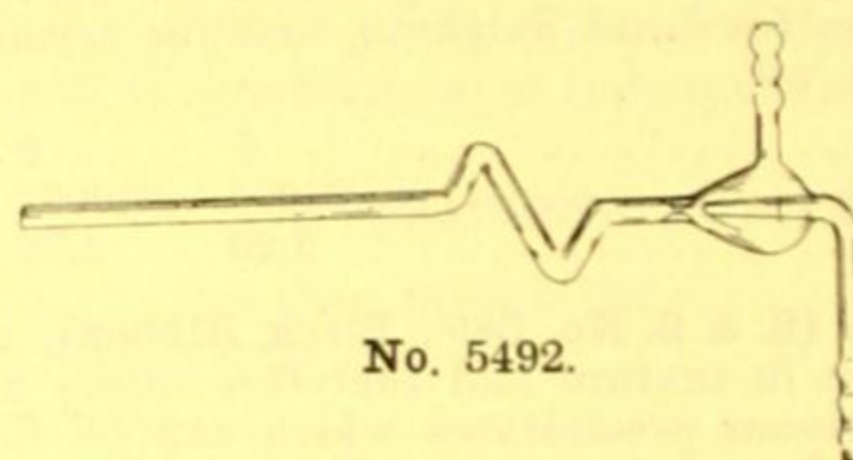
No. 5486.



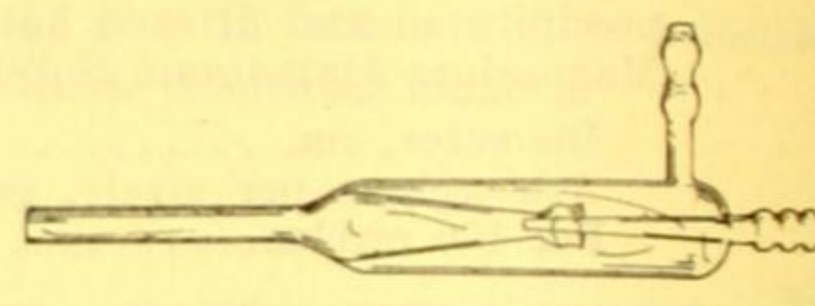
No. 5480.



No. 5482.



No. 5492.



No. 5494.

FILTER PLATES, see Filter Disks.

5468. **FILTER PRESS, Experimental Form**, for making practical tests on a small scale. It is of rugged construction, with parts of iron, built to stand a pressure of 150 pounds to the square inch. Both corrugated plates and extension frames are provided, enabling either filter paper or cloth to be used. Complete with reservoir, hand pump of iron with brass valves, pressure gage, siphon, brass discharge cocks, two filter plates, three frames, filter paper and cloth. Weight, about 125 pounds. \$80.00

5476. **FILTER PUMP, Aspirator**, new design, of brass. Very efficient.

No.	A	B	C
Length, inches.....	3¾	4¾	5¾
Size I. P. thread, inches.....	1/8	1/4	3/8
Each	1.35	1.50	2.00

10% discount in lots of 12.

5478. **FILTER PUMP, Richards'**, of brass.

No.	A	B	C
Length, inches.....	7	7	13
Size of I. P. thread, inches.....	1/8	3/8	3/4
Each	2.00	2.90	8.00

10% discount in lots of 12.

5480. **FILTER PUMP COUPLING**, of brass, to connect Nos. 5476 and 5478 to a threaded faucet.

No.	A	B	C	D
For filter pump, I. P. thread, inches.....	1/8	1/4	3/8	3/4
Each	.40	.40	.40	.90

10% discount in lots of 12.

5482. **FILTER PUMP COUPLING**, of brass, to connect Nos. 5476 and 5478 with smooth faucet.

No.	A	B	C
For filter pump, I. P. thread, inches.....	1/8	1/4	3/8
Each	.60	.60	.60

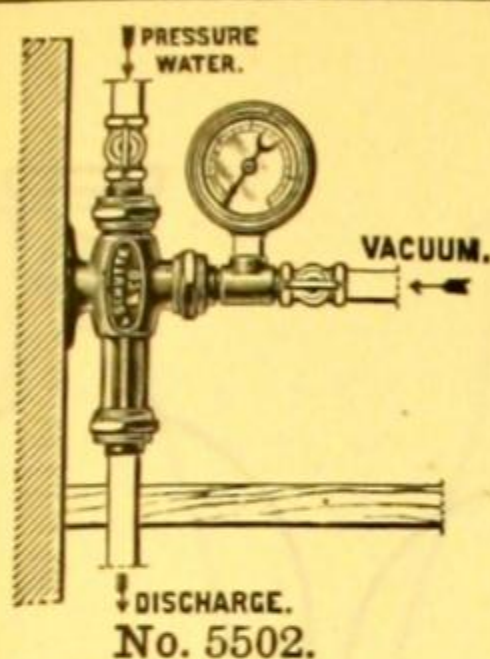
10% discount in lots of 12.

5486. **FILTER PUMP**, of brass, on base, with vacuum gage and stop-cocks on inlet and outlet tubes

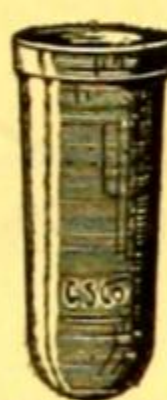
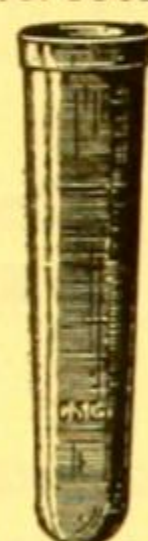
15.00

5492. **FILTER PUMP, Geissler's**, of glass..... 1.20

5494. **FILTER PUMP, Muencke's**, of glass..... 1.90



No. 5515.



No. 5516.



No. 5520.

5502. **FILTER PUMP, Water-Jet**, very efficient for use in filtration, percolation, evaporation, distillation, and condensation. May be permanently attached or may be used with rubber tube connections. Requires only 10 pounds water pressure. With 20 pounds pressure, the capacity is one-third cubic foot of air per minute. A one gallon vessel may be exhausted to a vacuum of 29½ inches of mercury in five minutes with 20 pounds pressure. Complete with vacuum gage, connection tee and two stop-cocks. \$22.75

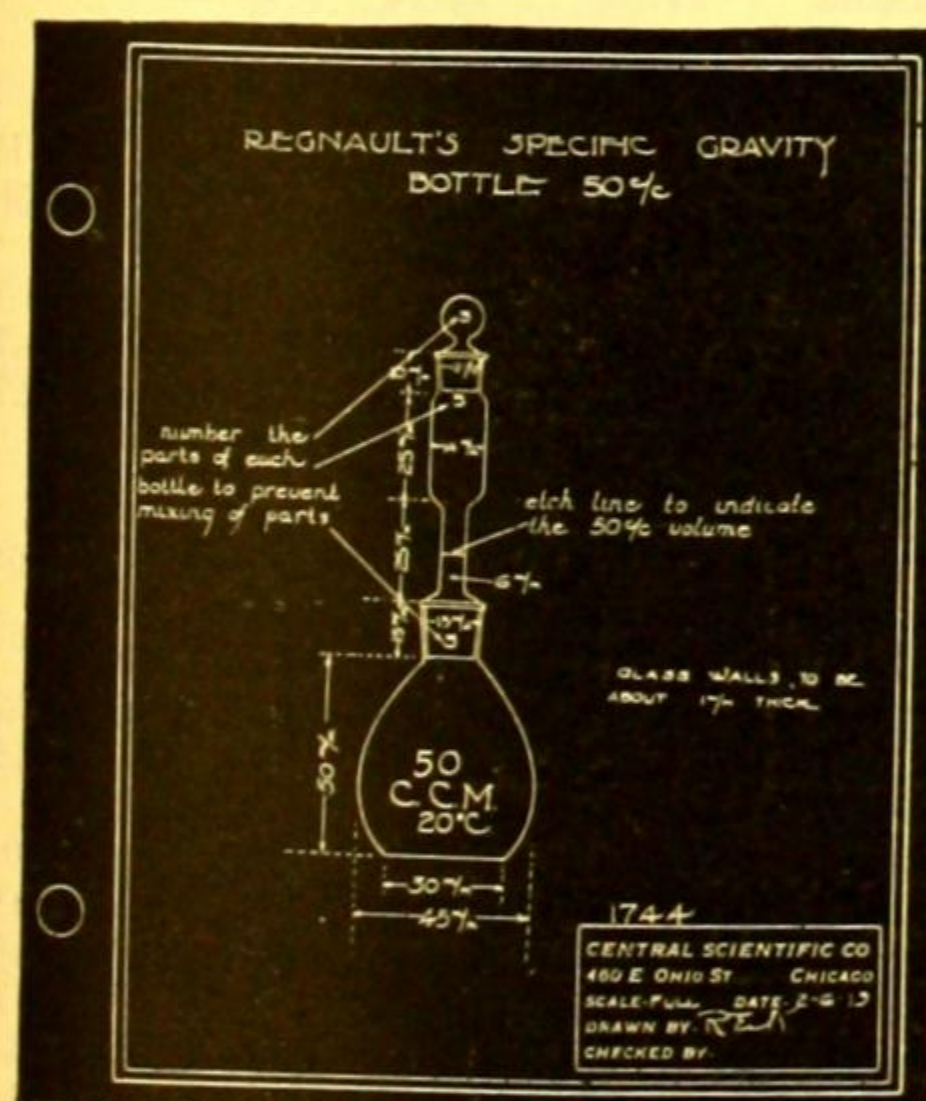
FILTER PUMP with Reservoir, for blast and suction, see No. 1414.

FILTER TUBES, Carbon, for use with Gooch crucibles, see No. 6124.

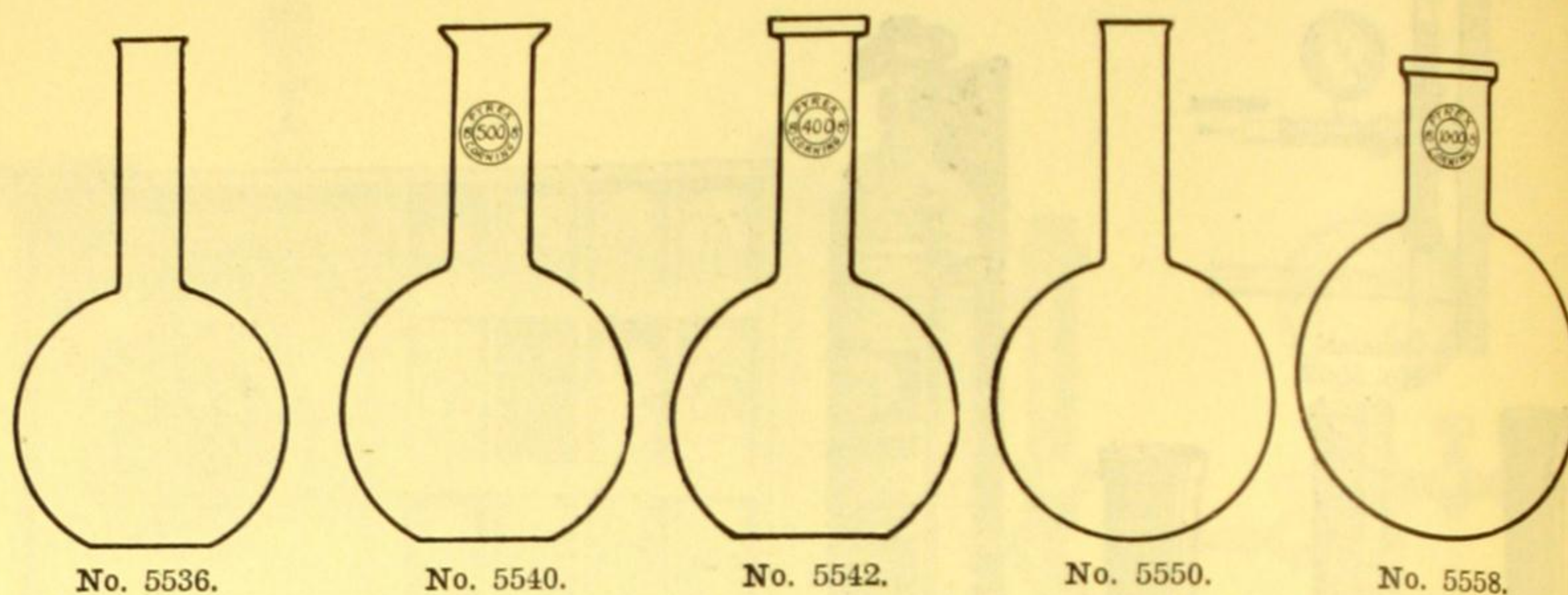
5515. **FINGER COTS, Rubber, Heavy**. No. A B C
For small medium thumb
Per dozen70 .70 .70

10% discount in lots of 144.

5516. **FIRE EXTINGUISHER, Pyrene**, quart size, for hanging up on wall of laboratory. Made of heavy seamless brass tubing. Ready for operation by simply turning the handle and pumping. One of these should be in every chemical laboratory, where its prompt use may prevent many destructive fires. Length over all, 14 inches; diameter 3 inches. With bracket for attachment to wall. 10.00
5520. **FIRST AID CABINET**. A neat metal case, 8x12x3½ inches deep, containing: one 1-inch gauze bandage; two 2-inch gauze bandages; one 2-inch cotton bandage to bind other dressings; one can mustard, especially prepared for emetics; two packages absorbent cotton; one package styptic gauze, medicated, to stop bleeding; one package surgical gauze, plain, for pads and compresses; one tourniquet, to stop arterial bleeding; one can powdered antiseptic soap, for washing hands and wounds; one can Recresco Ointment, for burns, scalds, cuts, etc.; one can Kap-sikar Embrocation, for use as counter-irritant, for sprains, strains, congestion, etc.; one package court plaster; three safety pins; one envelope hooks and eyes, to hang case on wall. An excellent cabinet to have about the laboratory for treating cuts and burns. Complete as described. 5.50



The illustration at the left is a photographic reduction of one of our thousands of blue prints by which we insure the accurate reproduction of scientific apparatus. Metal and wood workers have long been accustomed to work from blue prints and specification sheets, but the pre-war glass blower worked very largely by sight, feel or habit. As a result there were no standards of size and no uniformity in design. During the past seven years we have made a careful search of the literature for specifications and have consulted freely leaders in the various scientific fields until we have secured as correct and authentic information regarding specifications as possible. This information regarding each item has been incorporated in a master tracing, the blue prints from which are given to the glass blower as his instructions. The finished articles are inspected and checked by a duplicate blue print. A supply of uniformly made glassware of correct size and design is thus made available for discriminating laboratory workers. When special pieces are made to order, similar tracings are made and filed so that accurate reproductions may be obtained by research workers at any time.



No. 5536.

No. 5540.

No. 5542.

No. 5550.

No. 5558.

FLASKS, ALL KINDS

5536. FLASKS, Flat Bottom, Resistance grade, with vial mouth.

Capacity, cc.....	50	125	250	500	1000	2000
To take rubber stopper, No.....	1	3	3	5	6	8
Number in original case.....	190	120	160	90	50	20
Each	\$ 0.13	.15	.17	.20	.29	.40
Per original case.....	22.23	16.20	24.48	16.20	13.05	7.20

5540. FLASKS, Flat Bottom, Pyrex Glass, with vial mouth.

Capacity, cc.....	50	125	250	500	
To take rubber stopper, No.....	0	1	3	6	
Number in original case.....	192	168	144	72	
Each	.17	.19	.24	.30	
Per original case.....	29.37	29.53	31.10	19.44	
Capacity, cc.....	1000	2000	3000	6000	12000
To take rubber stopper, No.....	7	8	9	10	13
Number in original case.....	36	18	12	12	6
Each	.43	.60	.76	1.60	3.30
Per original case.....	13.93	9.72	8.20	17.28	17.82

5542. FLASKS, Flat Bottom, Pyrex Glass, with heavy ring neck.

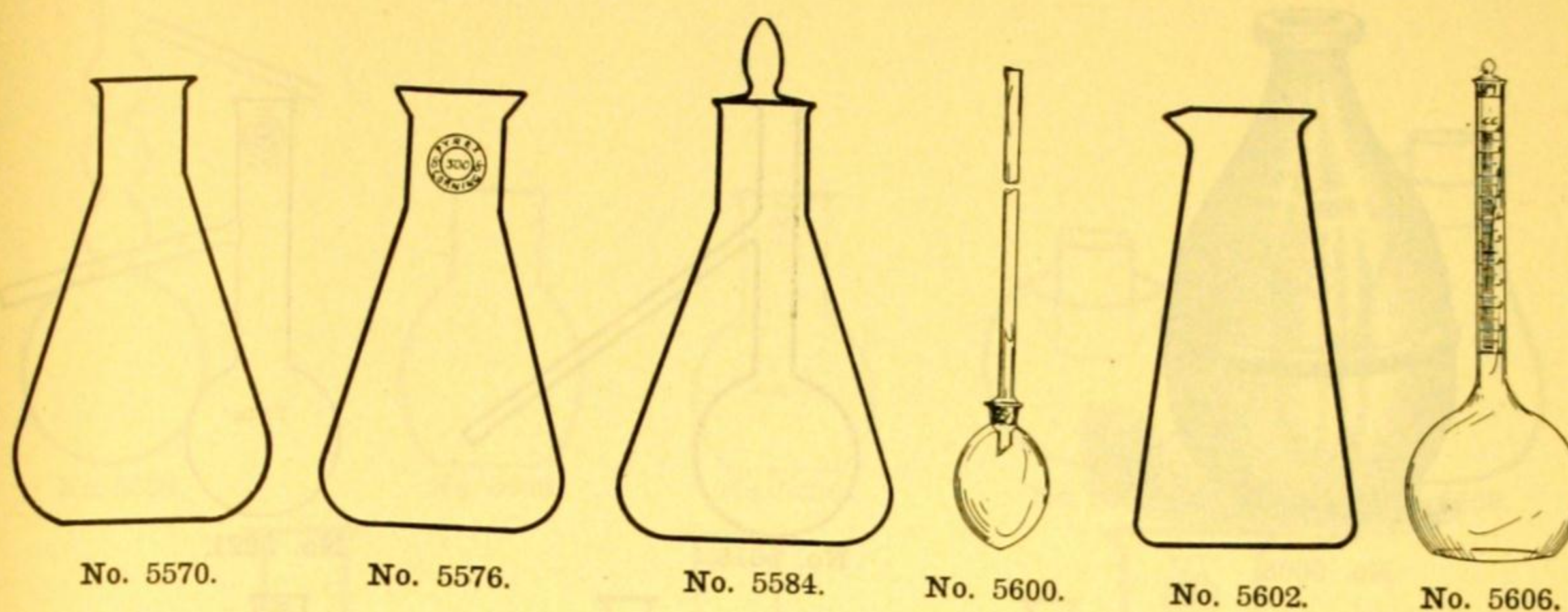
Capacity, cc.....	500	1000	2000	3000	6000
To take rubber stopper, No.....	5	7	8	9	10
Number in original case.....	72	36	18	12	12
Each	.38	.55	.78	.99	1.75
Per original case.....	24.62	17.82	12.63	10.69	18.90

5550. FLASKS, Round Bottom, Pyrex Glass, with vial mouth.

No.	A	B	C	D	F	H
Capacity, cc.....	100	200	300	500	1000	2000
To take rubber stopper, No.....	2	3	4	4	6	9
Number in original case.....	84	144	84	48	30	18
Each	.18	.22	.28	.37	.56	.79
Per original case.....	13.60	28.51	21.16	15.98	15.12	12.79

5558. FLASKS, Round Bottom, Balloon Form, Pyrex Glass, with short ring neck.

Capacity, cc.....	200	500	1000	2000	3000	5000	12000
To take rubber stopper, No.....	3	6	8	10	10	11	11
Number in original case.....	144	72	36	18	12	6	6
Each	.28	.38	.55	.78	.99	1.40	3.50
Per original case.....	36.28	24.62	17.82	12.63	10.69	7.56	18.90
Capacity, cc.....				22000	50000		72000
Diameter of flask, in.....				13 $\frac{3}{4}$	18		20 $\frac{1}{2}$
Diameter of neck inside, in.....				3 $\frac{5}{16}$	4 $\frac{3}{8}$		4 $\frac{1}{4}$
Number in original case.....				8	4		1
Each				7.00	16.00		38.00
Per original case.....				50.40	57.60		38.00



5570. FLASKS, Erlenmeyer, Resistance Grade.

Capacity, cc.....	50	125	250	500	1000	2000
To take rubber stopper, No.....	0	2	4	6	8	9
Number in original case.....	190	120	160	90	50	20
Each	\$ 0.13	.15	.17	.20	.29	.40
Per original case.....	22.23	16.20	24.48	16.20	13.05	7.20

5576. FLASKS, Erlenmeyer, Pyrex Glass.

Capacity, cc.....	50	125	200	250	500
To take rubber stopper, No.....	1	3	5	5	6
Number in original case.....	276	180	144	132	72
Each	.16	.18	.20	.22	.29
Per original case.....	39.74	29.16	25.92	26.13	18.79
Capacity, cc.....	1000	2000	3000	4000	6000
To take rubber stopper, No.....	8	10	10	10	10
Number in original case.....	36	24	15	12	6
Each	.42	.60	.79	1.00	1.60
Per original case.....	13.60	12.96	10.66	10.80	8.64

5578. FLASKS, Erlenmeyer, Pyrex Glass, with extra wide mouth.

Capacity, cc.....	250	500
To take rubber stopper, No.....	8	10
Number in original case.....	132	60
Each	.22	.29
Per original case.....	26.13	15.66

5584. FLASKS, Erlenmeyer, with Ground Glass Stopper, Resistance Grade.

Capacity, cc.....	125	250	500
Each	.45	.67	.90

10% discount in lots of 12.

5600. FLASK, Acetylation, with ground in condensing tube, for assaying menthol in oil of peppermint. Capacity, about 150 cc; length of condensing tube, 100 cm. (See United States Pharmacopoeia for 1916, page 296).....

1.12

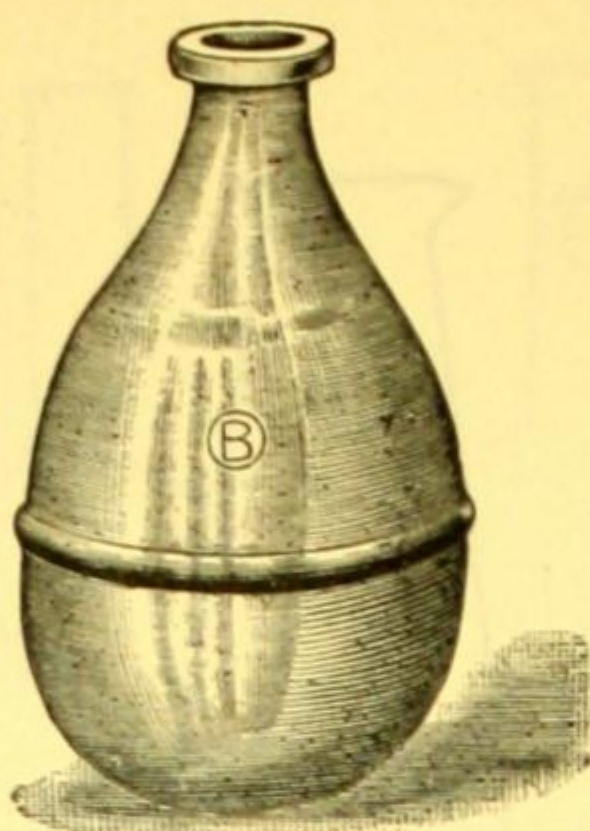
10% discount in lots of 12.

5602. FLASKS, Assay Beaker Flasks, Resistance Grade, high form, with lip.

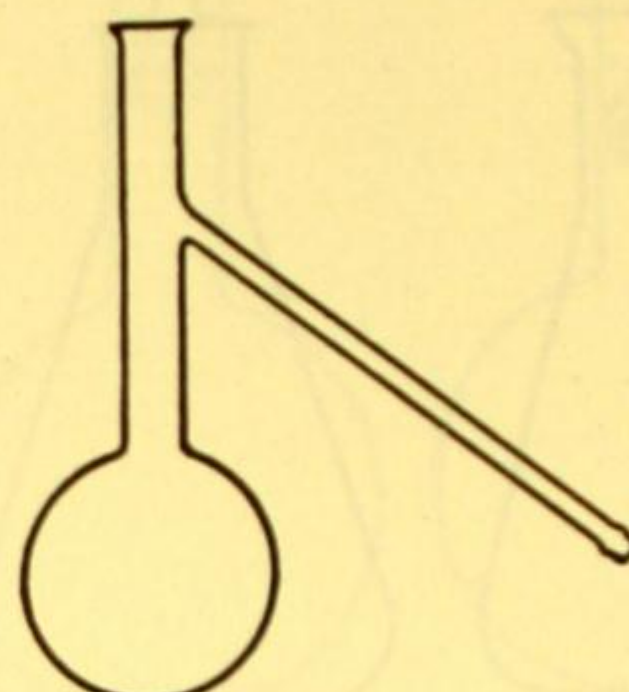
Capacity, cc.....	125	250	500
Number in original case.....	140	160	90
Each	.18	.24	.28
Per original case.....	22.68	34.56	22.68

5606. FLASK, Cassia, with ground glass stopper, as used in the official U. S. P. method, for assaying cinnamic aldehyde. Total capacity, about 200 cc; neck graduated to 10 cc in $\frac{1}{10}$ cc divisions. (See United States Pharmacopoeia for 1916, page 289).....

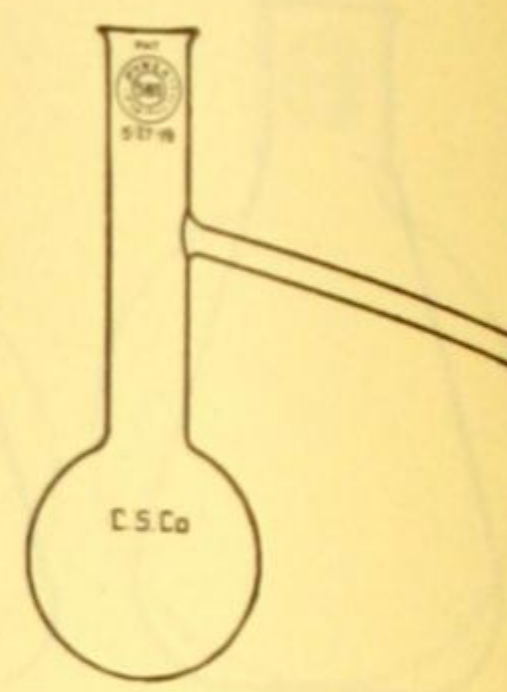
2.00



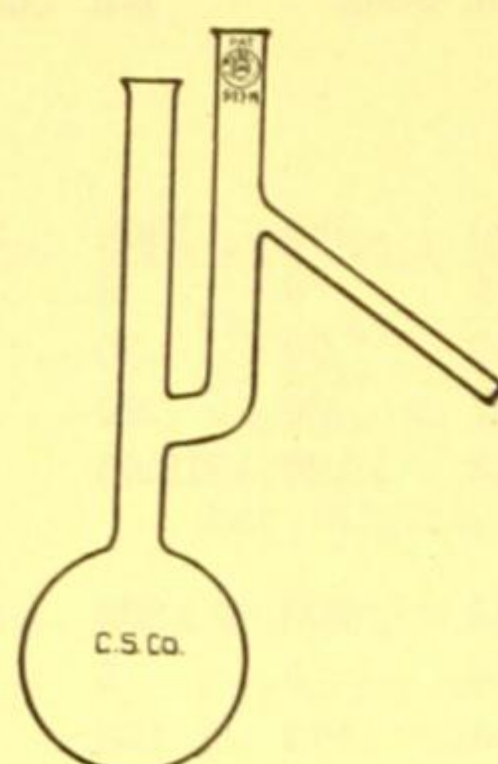
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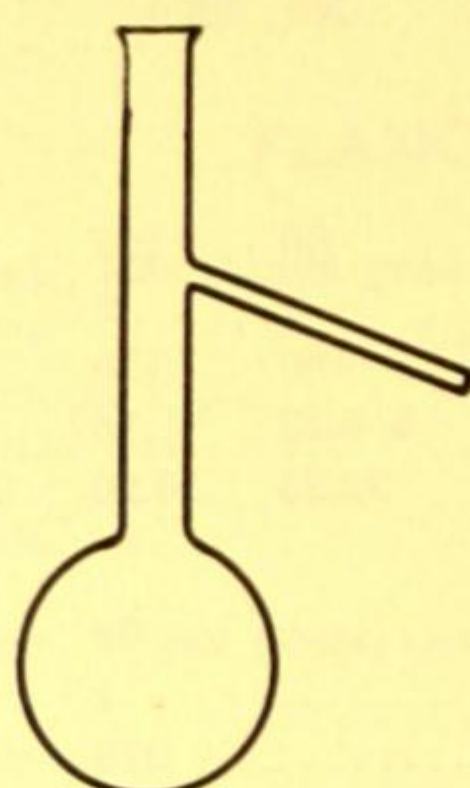
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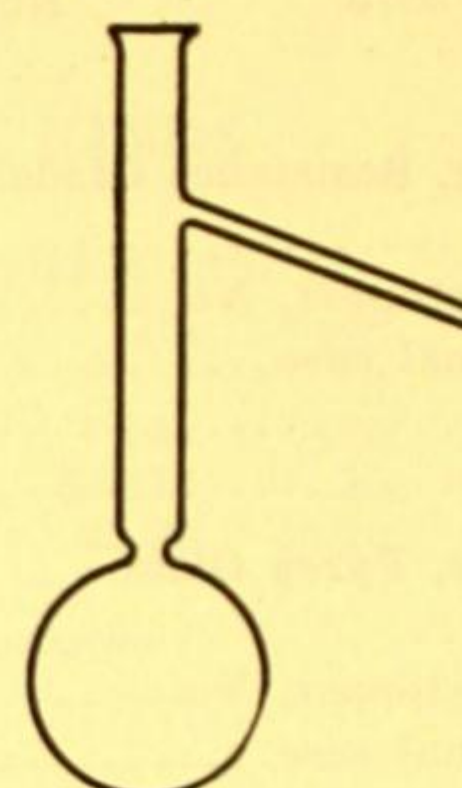
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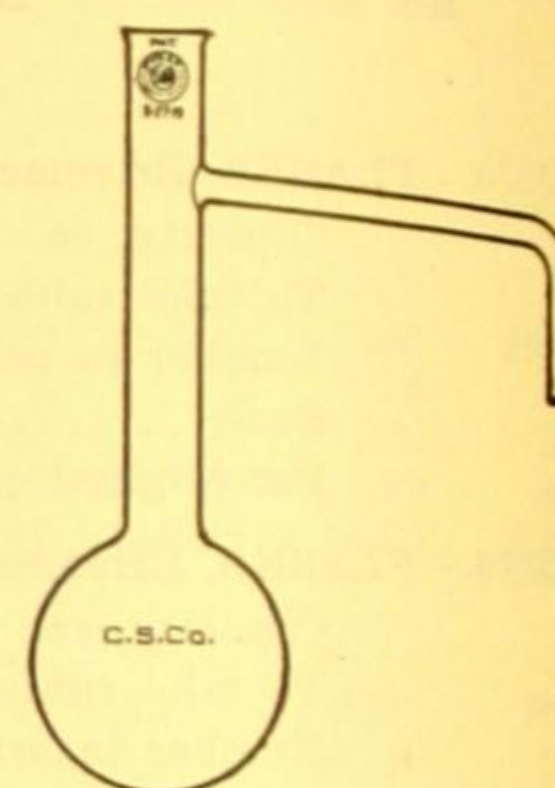
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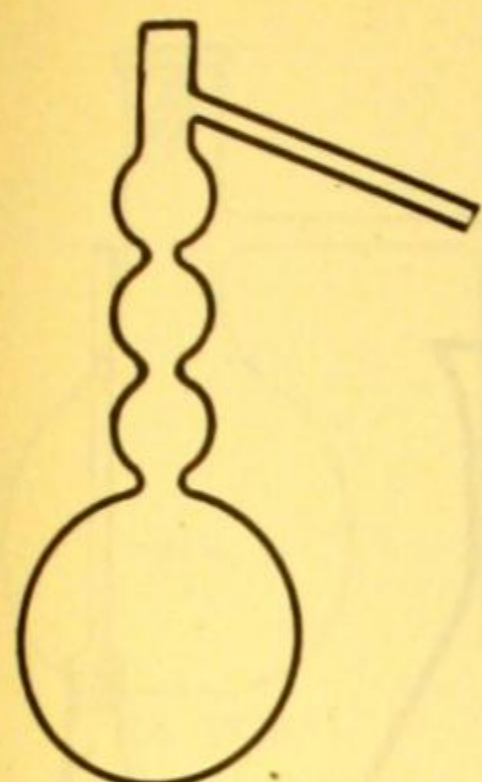


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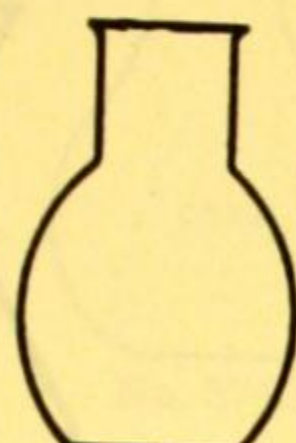


No. 5634.

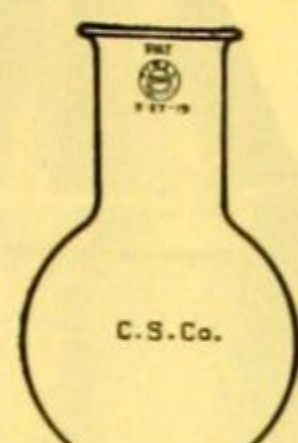
5608.	FLASKS, Copper, heavy, polished, with ring neck. Capacity, cc.....	500	1000
	Each	\$2.50	3.00
	FLASKS, Dewar, see Vacuum Tubes.		
5616.	FLASKS, Distilling, Resistance Grade, with side tube in middle of neck.		
	Capacity, cc.....	125	250 500 1000
	To take rubber stopper, No.....	3	3 5 5
	Number in original case.....	40	40 30 20
	Each	0.33	.40 .47 .79
	Per original case.....	11.88	14.40 12.69 14.22
5618.	FLASKS, Distilling, Pyrex Glass, with side tube in middle of neck.		
	Capacity, cc.....	50	125 250
	To take rubber stopper, No.....	1	2 3
	Number in original case.....	60	48 24
	Each	.45	.55 .66
	Per original case.....	21.60	21.60 12.96
	Capacity, cc.....	500	1000 2000 3000
	To take rubber stopper, No.....	4	6 9 10
	Number in original case.....	21	12 6 6
	Each	.77	1.30 1.75 2.35
	Per original case.....	13.23	12.74 8.64 11.61
5621.	FLASKS, Distilling, Barrett, Pyrex Glass, for distillation of benzol, capacity 200 cc.....		.70
5622.	FLASKS, Distilling, Claissen, Pyrex Glass, for organic distillations.		
	Capacity, cc.....	125	250 500 1000
	Each	1.60	1.80 2.20 3.00
5624.	FLASKS, Distilling, Engler, Pyrex Glass, for fractional distillation of creosote and petroleum oils. Made to standard dimensions according to the American Society for Testing Materials and the U. S. Bureau of Mines. The 100 cc size is the standard flask for the distillation test of gasoline; the 200 cc size is standard for bituminous materials.		
	Capacity, cc	100	200 250
	To take rubber stopper, No.	1	2 2
	Number in original case.....	54	48 48
	Each	.60	.65 .70
	Per original case.....	29.16	28.08 30.24
5632.	FLASKS, Distilling, Hempel, Pyrex Glass, for the distillation of creosote. (See Circular 112, Forest Service of United States Department of Agriculture.) Capacity, 500 cc.....		1.75
5634.	FLASKS, Distilling, Hempel, Pyrex Glass, for analytical distillation of petroleum, capacity 500 cc. (See Bulletin No. 125 of the United States Bureau of Mines.).....		1.50



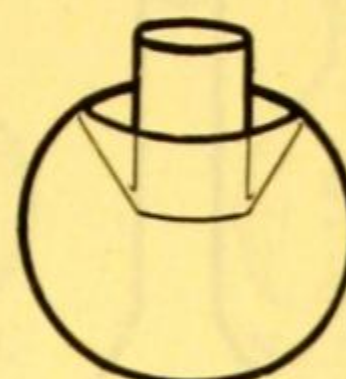
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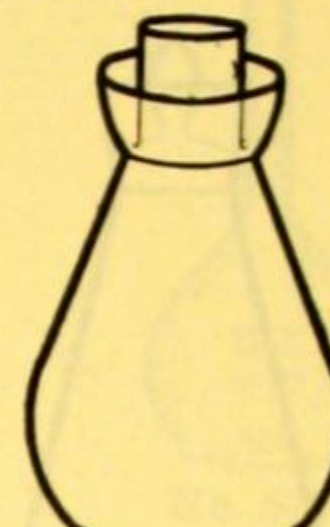
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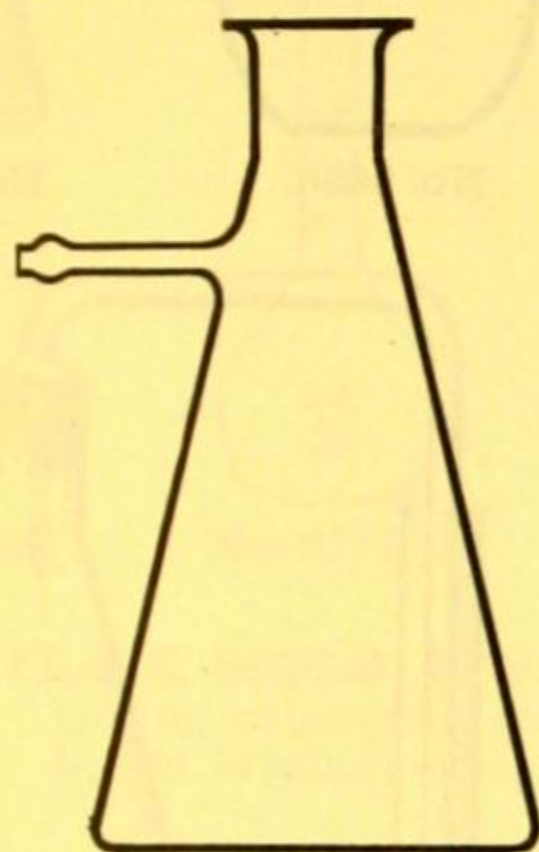
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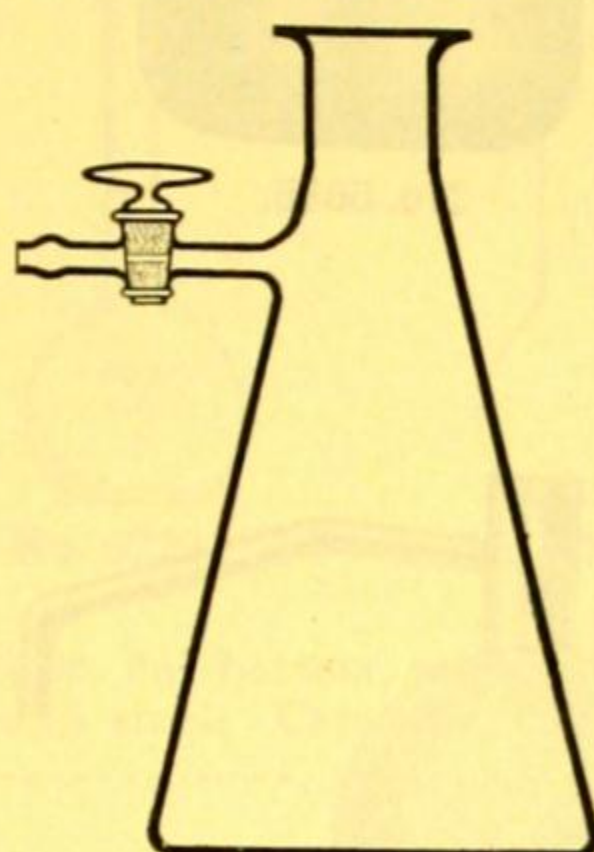
No. 5656.



No. 5658.



No. 5664.



No. 5666.



No. 5670.

5636. **FLASKS, Distilling, Ladenburg, Pyrex Glass, with three bulbs in neck.** Capacity, 500 cc \$1.20
 Note:—Other types of distilling flasks will be made to specifications.

5646. FLASKS, Extraction, Resistance Grade, flat bottom, with wide mouth and vial neck.					
Capacity, cc	100	150	250		
To take rubber stopper, No.	6	7	8		
Number in original case.	120	100	160		
Each	.18	.20	.22		

10% discount in lots of 12.

5650. FLASKS, Extraction, Pyrex Glass, flat bottom, with wide mouth and vial neck.						
Capacity, cc	50	100	150	250	500	750
To take rubber stopper, No.....	6	6	7	8	10	10
Number in original case.....	168	120	108	120	60	48
Each	.16	.18	.19	.20	.29	.36
Per original case.....	24.19	19.44	18.46	21.60	15.66	15.55

5656. **FLASKS, Extraction, Knorr's, as modified by Walter and Goodrich, with two holes in neck for return flow of ether.** Capacity, 100 cc.60

5658. **FLASKS, Extraction, Sy's Form, with trough for mercury seal and with holes in neck for return of ether.** Capacity, 100 cc.60

For other **EXTRACTION FLASKS**, see Nos. 5209 and 5228.

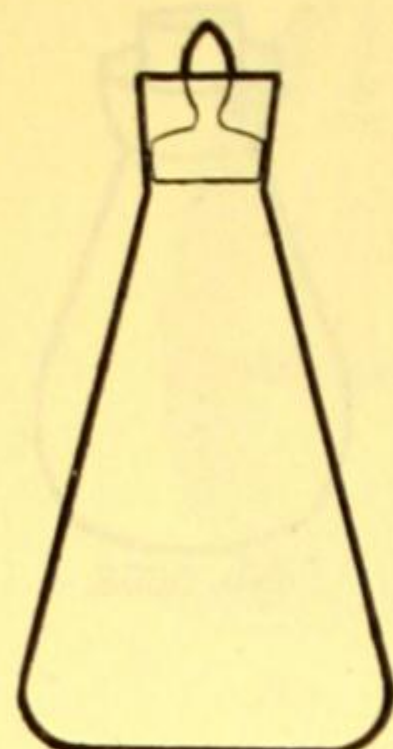
5664. FLASKS, Filtering, Resistance Grade, Erlenmeyer form, of heavy glass, with side neck.					
Capacity, cc	250	500	1000	2000	
To take rubber stopper, No.	4	6	7	8	
Number in original case.	60	40	20	20	
Each	.55	.63	.96	1.60	
Per original case.	29.70	22.68	17.28	28.80	

5666. FLASKS, Filtering, same as No. 5664, with glass stop-cock on side neck.					
Capacity, cc	500	1000			
Each	2.25	3.75			

10% discount in lots of 12.

5670. FLASKS, Filtering, Pyrex Glass, Erlenmeyer form, with side neck.					
Capacity, cc	250	500	1000	2000	4000
To take rubber stopper, No.	6	6	7	9	9
Number in original case.	96	60	24	15	6
Each	.70	.95	1.45	2.40	4.00
Per original case.	60.48	51.30	31.32	32.40	21.60

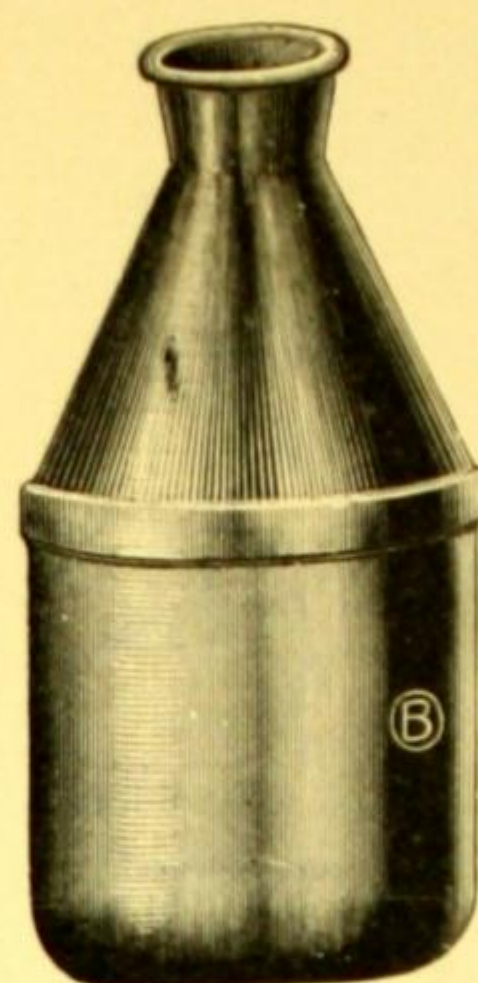
FLASKS, Gas Generating, see Gas Generators.



No. 5674.



No. 5682.



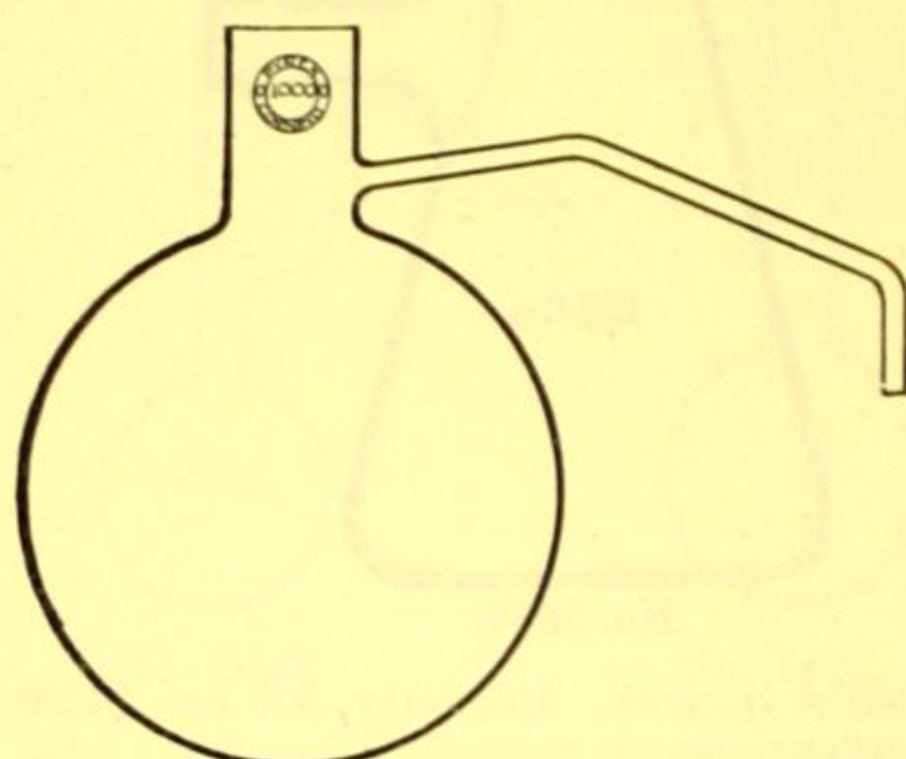
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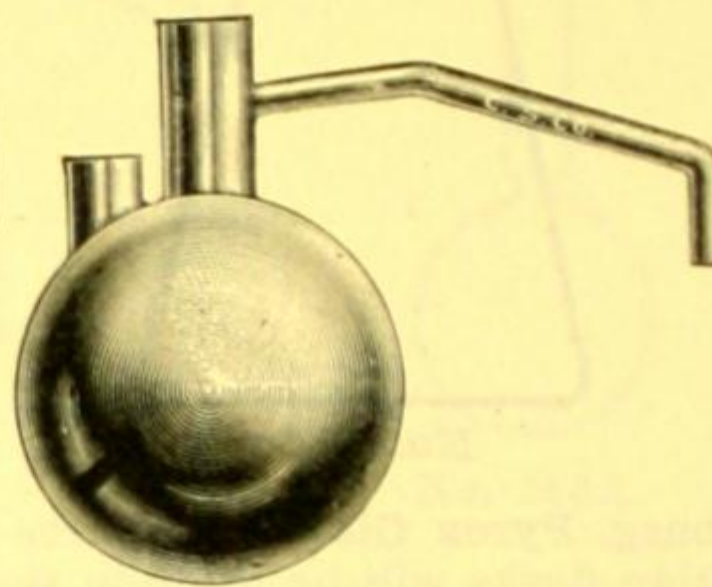
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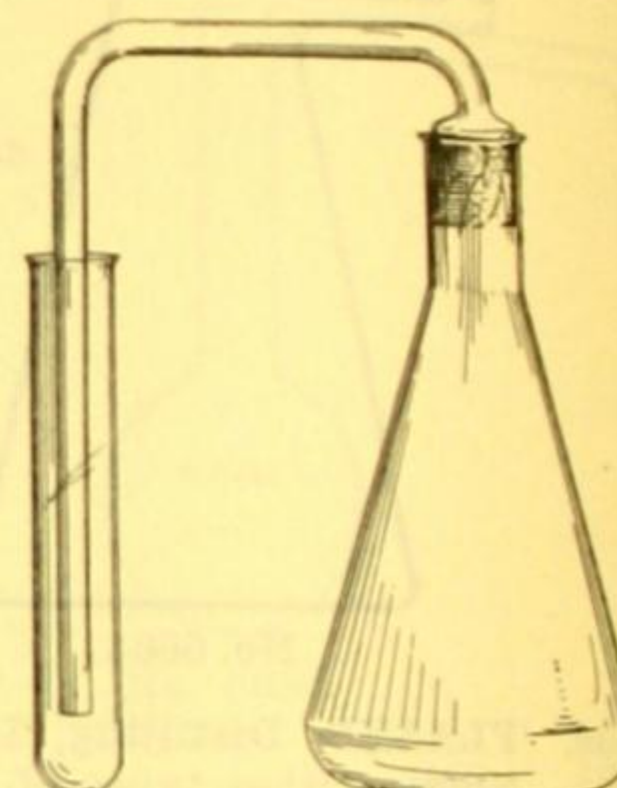
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No. 5698.

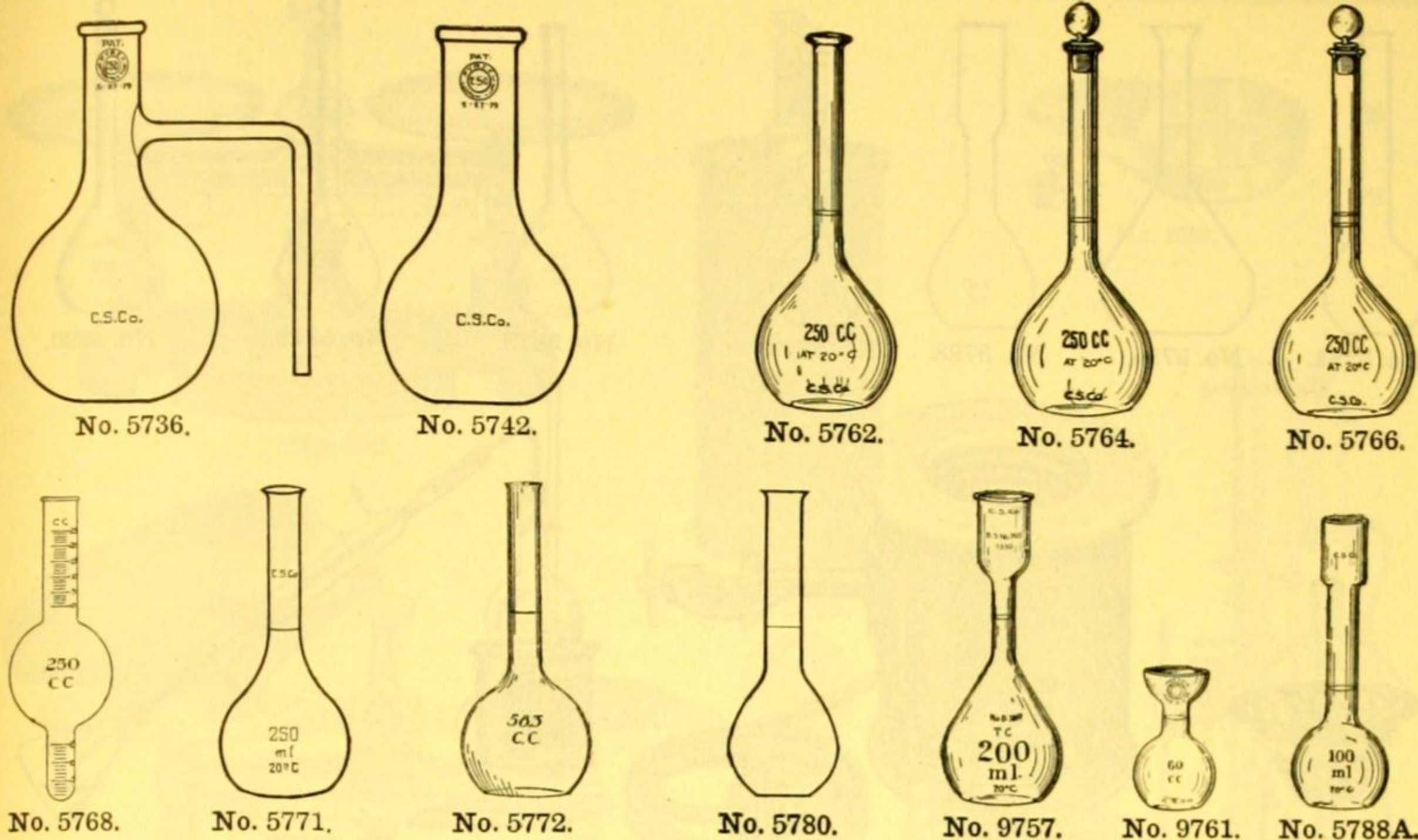


No. 5704.



No. 5732.

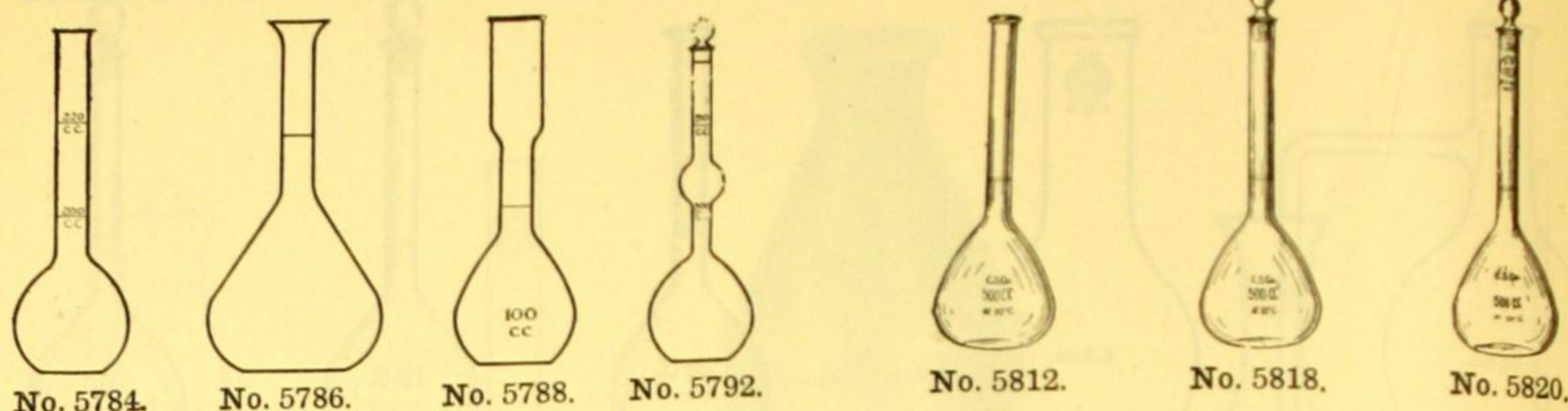
5674. **FLASKS**, for Iodine Number Determination of Oils, Resistance Grade, Erlenmeyer form, with flaring lip and hollow stopper ground deep in neck to form reservoir.
- | | | | |
|--------------------|--------|-----|------|
| Capacity, cc | 125 | 250 | 500 |
| Each | \$0.60 | .80 | 1.00 |
5682. **FLASKS**, Kjeldahl, Pyrex Glass, with long neck and round bottom.
- | | | | |
|----------------------------------|-------|-------|-------|
| Capacity, cc | 300 | 500 | 800 |
| To take rubber stopper, No. | 5 | 6 | 7 |
| Total length, mm. | 298 | 323 | 365 |
| Number in original case. | 60 | 36 | 36 |
| Each | .28 | .37 | .45 |
| Per original case. | 15.12 | 11.98 | 14.58 |
5686. **FLASK**, Kjeldahl, Copper, heavy, with flat bottom. Diameter, 4 inches; height, 8½ inches; capacity, 1000 cc. 4.50
5690. **FLASKS**, Low's, for Copper Determinations, Pyrex Glass, improved form, with flaring neck.
- | | | |
|----------------------------------|-------|-------|
| Capacity, cc | 180 | 250 |
| Number in original case. | 144 | 108 |
| To take rubber stopper, No. | 5 | 6 |
| Each | .25 | .30 |
| Per original case. | 32.40 | 29.16 |
5698. **FLASK**, Moisture, of Pyrex Glass, for use in official Brown-Duvel Moisture Tester for determining moisture in grain. Capacity, 1000 cc. (See Circular No. 72, Bureau of Plant Industry, United States Department of Agriculture.) 1.50
5704. **FLASK**, Moisture, Copper, double wall, for use in Brown-Duvel Moisture Tester, for determining moisture in flour and ground samples. Capacity of the inner vessel, 900 cc. (See Bulletin No. 56 of the Bureau of Plant Industry, United States Department of Agriculture.) 9.00
5728. **FLASK**, Soil Analysis, Pyrex glass, Erlenmeyer form, with condenser tube 100 cm long ground in neck. Capacity, 250 cc. 2.40
5732. **FLASK**, Sulphur, for use in detecting sulphured grain. Consists of an Erlenmeyer flask with ground in stopper and delivery tube. Capacity, 500 cc. (See Circular 111 of the Bureau of Plant Industry, United States Department of Agriculture.) 1.50



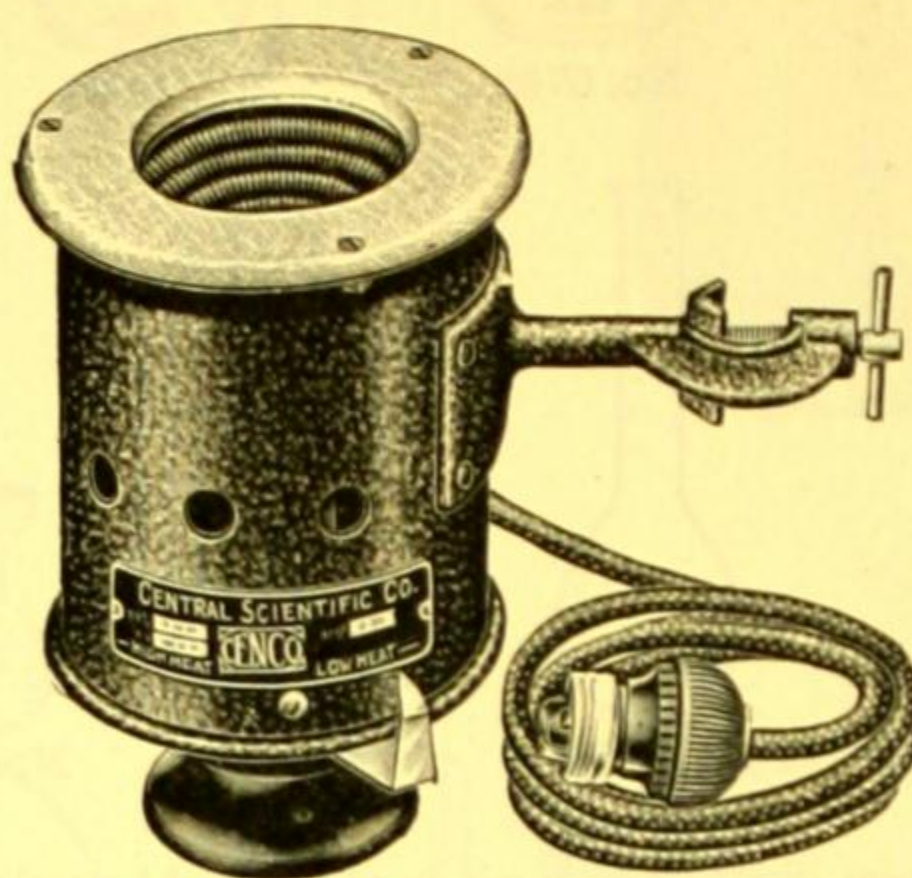
5736. **FLASK, Sulphur, Pyrex glass**, flat bottom, with side neck bent at right angle, as used in determining sulphur in iron and steel. Capacity, 250 cc; neck takes a No. 5 rubber stopper. Number in original case, 40.....Each \$0.75
Per original case 27.00
5742. **FLASK, Sulphur, Johnson's, Pyrex glass**, with heavy ring neck taking a No. 6 rubber stopper. Capacity to base of neck, 275 cc. Number in original case, 108.....Each .32
Per original case 31.10
- FLASKS, Vacuum, see Vacuum Tubes.**
9757. **FLASK, Viscosimeter**, for use with Engler viscosimeter, graduated to contain 200 cc of oil at 20° C. With government certificate..... 3.75
- 5788B. **FLASK, Viscosimeter**, same as No. 9757, but without certificate..... .70
9761. **FLASK, Viscosimeter, Pyrex**, for use with Saybolt viscosimeter, graduated to contain 60 cc of oil at 20° C..... 1.25
- 5788A. **FLASK, Viscosimeter**, for use with Ubbelohde viscosimeter, graduated to contain 100 cc of kerosene or gasoline at 20° C..... .50
5762. **FLASKS, Volumetric**, accurately graduated to contain, without stopper.
- | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|-----|------|------|
| Capacity, cc | 10 | 25 | 50 | 100 | 200 | 250 | 500 | 1000 | 2000 |
| Each | .35 | .38 | .40 | .45 | .53 | .58 | .67 | 1.00 | 1.80 |
- 10% discount in lots of 10, 20% discount in lots of 100.
5764. **FLASKS, Volumetric**, same as No. 5762, but with glass stopper ground in.
- | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|------|------|------|
| Capacity, cc | 10 | 25 | 50 | 100 | 200 | 250 | 500 | 1000 | 2000 |
| Each | .58 | .60 | .62 | .78 | .85 | .90 | 1.10 | 1.45 | 2.25 |
- 10% discount in lots of 10, 20% discount in lots of 100.
5766. **FLASKS, Volumetric**, with glass stopper and two marks on neck, graduated both to contain and deliver. Capacity, cc
- | | | | | |
|------|-----|------|------|------|
| | 100 | 250 | 500 | 1000 |
| Each | .90 | 1.10 | 1.30 | 1.70 |
- 10% discount in lots of 10, 20% discount in lots of 100.
5768. **FLASK, Volumetric, Foots Flask**, graduated, for determining fatty acid in cottonseed by saponification. Capacity of bulb, 250 cc..... 2.00
5771. **FLASK, Volumetric, Pyrex glass**, with wide neck and mark low on neck. Used in fertilizer laboratories for Phosphoric Acid determination. Capacity, 250 cc; number in original case, 108 1.00
Per original case 97.20
5772. **FLASK, Volumetric**, graduated to deliver 58.3 cc, for determining degree of alkalinity in feed water for boilers..... 1.00
5780. **FLASK, Volumetric, Pyrex glass**, with wide neck, for determination of insoluble phosphoric acid. Capacity, 200 cc; diameter of neck inside, 25 mm; number in original case, 108.. .90
Per original case 87.48

FLASKS

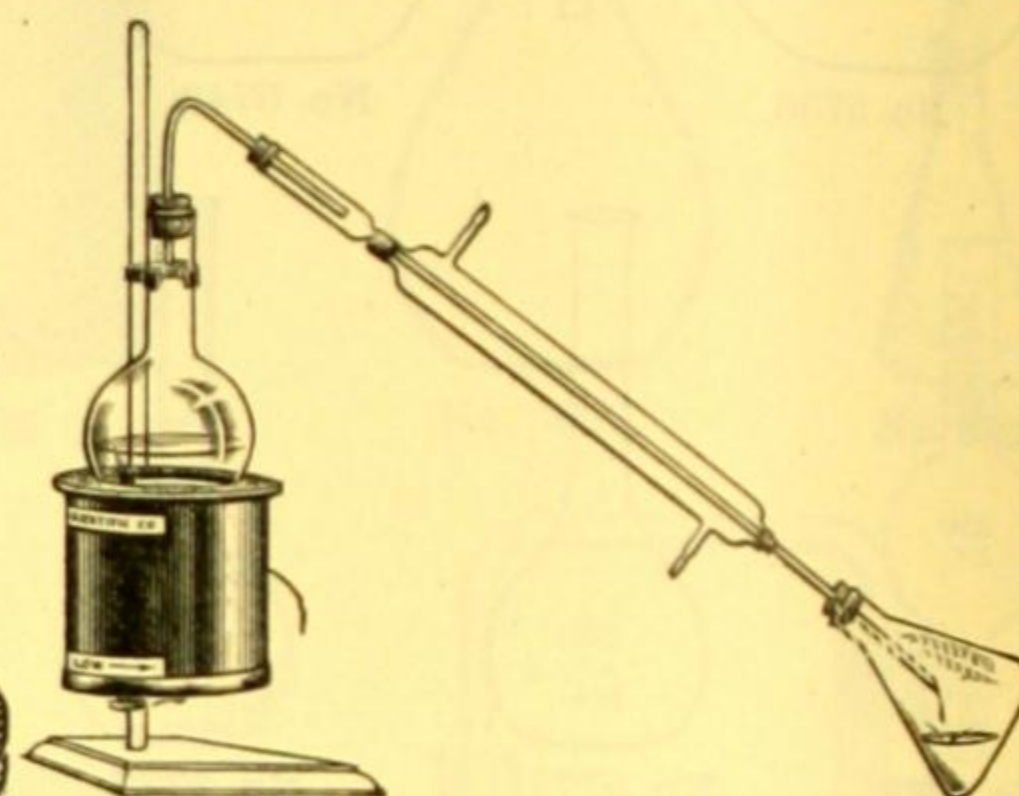
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 5846.



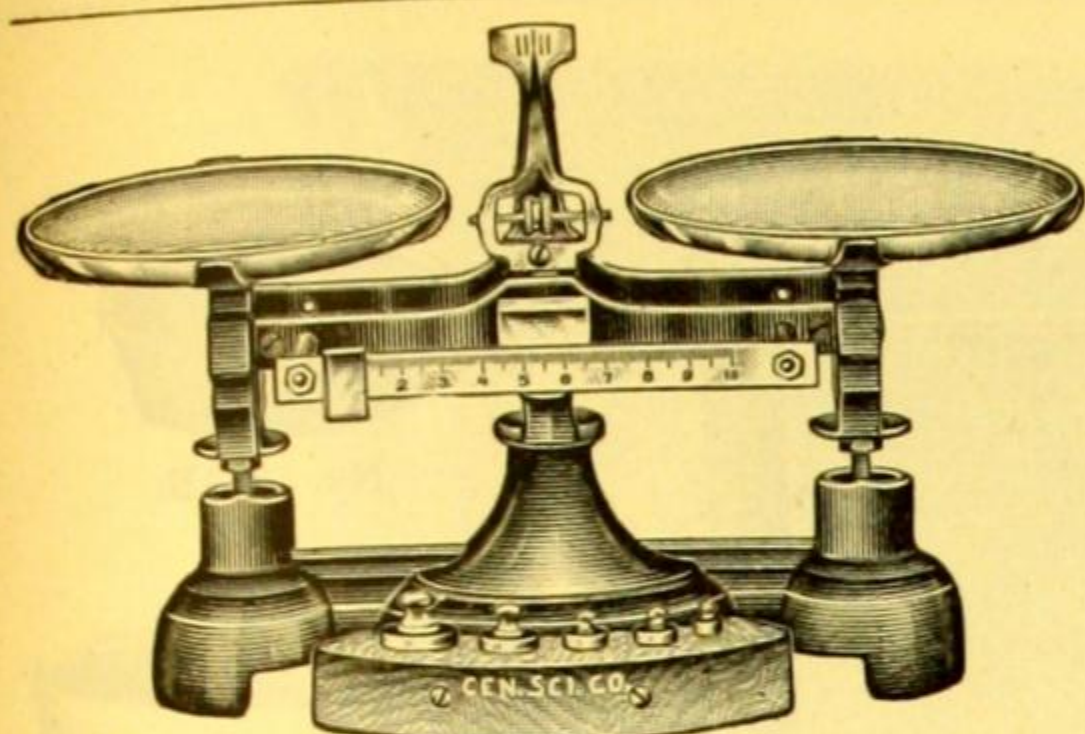
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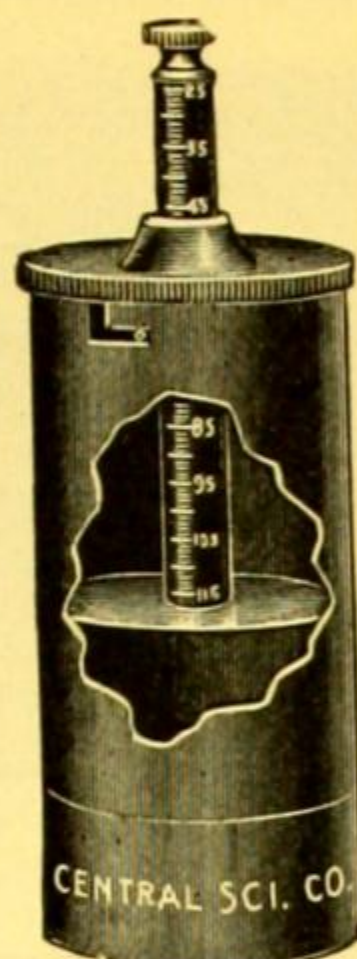
No. 9647C.

As used in the distillation of inflammable liquids of high boiling point.

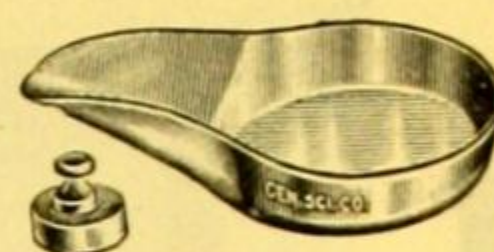
5784. **FLASKS, Volumetric, Sugar, with two marks on neck, without stopper.**
 Graduated at, cc..... 50 & 55 100 & 110 200 & 220
 Each \$0.40 .60 .80
5786. **FLASK, Volumetric, Sugar, Bates' Form, pear shape with funnel top. Capacity, 100 cc..** .50
5788. **FLASKS, Volumetric, Sugar, Kohlrausch Form, with enlarged mouth, and one mark on neck.**
 No. A B
 Graduated at, cc..... 100 200
 Each50 .70
5792. **FLASKS, Volumetric, Gile's Form, glass stoppered, with bulb in neck and two marks. Used extensively for making normal solutions, as the 10 per cent. extra volume in the bulb may be used for checking, leaving an exact volume for correction.**
 Graduated at, cc..... 500 & 550 1000 & 1100 2000 & 2200
 Each 2.00 2.75 4.00
5812. **FLASKS, Volumetric, Precision or Normal, without stopper, graduated to meet the requirements of the United States Bureau of Standards.**
 Graduated to contain, cc..... 50 100 250 500 1000 2000
 Each 1.30 1.40 1.60 2.20 3.30 4.40
5818. **FLASKS, Volumetric, Precision or Normal, same as No. 5812, but with glass stopper.**
 Graduated to contain, cc..... 25 50 100 250 500 1000 2000
 Each 1.60 1.80 2.00 2.40 3.00 4.50 6.00
5820. **FLASKS, Volumetric, Precision or Normal, same as No. 5818, but standardized by the United States Bureau of Standards, with control stamp.**
 Graduated to contain, cc..... 100 250 500 1000 2000
 Each 3.40 4.00 4.60 6.50 8.00
9647. **FLASK HEATER, Cenco Electric, with regulating rheostat by means of which the heat may be intensified or diminished. Because of this feature, peculiar to the Cenco heater, it may be substituted to advantage for the Bunsen burner in many laboratory operations, such as the distillation of inflammable liquids, ashing of easily volatile products, digestion and distillation in the Kjeldahl method, extractions, ignition of precipitates, etc. Diameter of opening, 2½ inches; energy consumption, 250 watts. With clamp to fasten on any support stand, cord and separable plug for attachment to any lamp socket. (For complete description, see page 368.)**
 No. C D
 For volts 110 220
 Each 16.00 17.00
- FLASK HEATER, Electric Water Bath, see No. 14296 De Khotinsky Electrically Heated Water Bath.**
- FLASK HEATER, Electric Hot Plate, see No. 7514 Heater, Combination Electric.**
5846. **FLASK HEATERS, of sheet iron, with asbestos strips fastened to sides, and openings for ventilation.**
 Diameter, inches 4½ 5 6 7½ 8¼ 10½
 Each 1.00 1.15 1.30 1.50 1.75 2.00
- FLASK HOLDER, Suberite, see Cork Rings, No. 3296.**



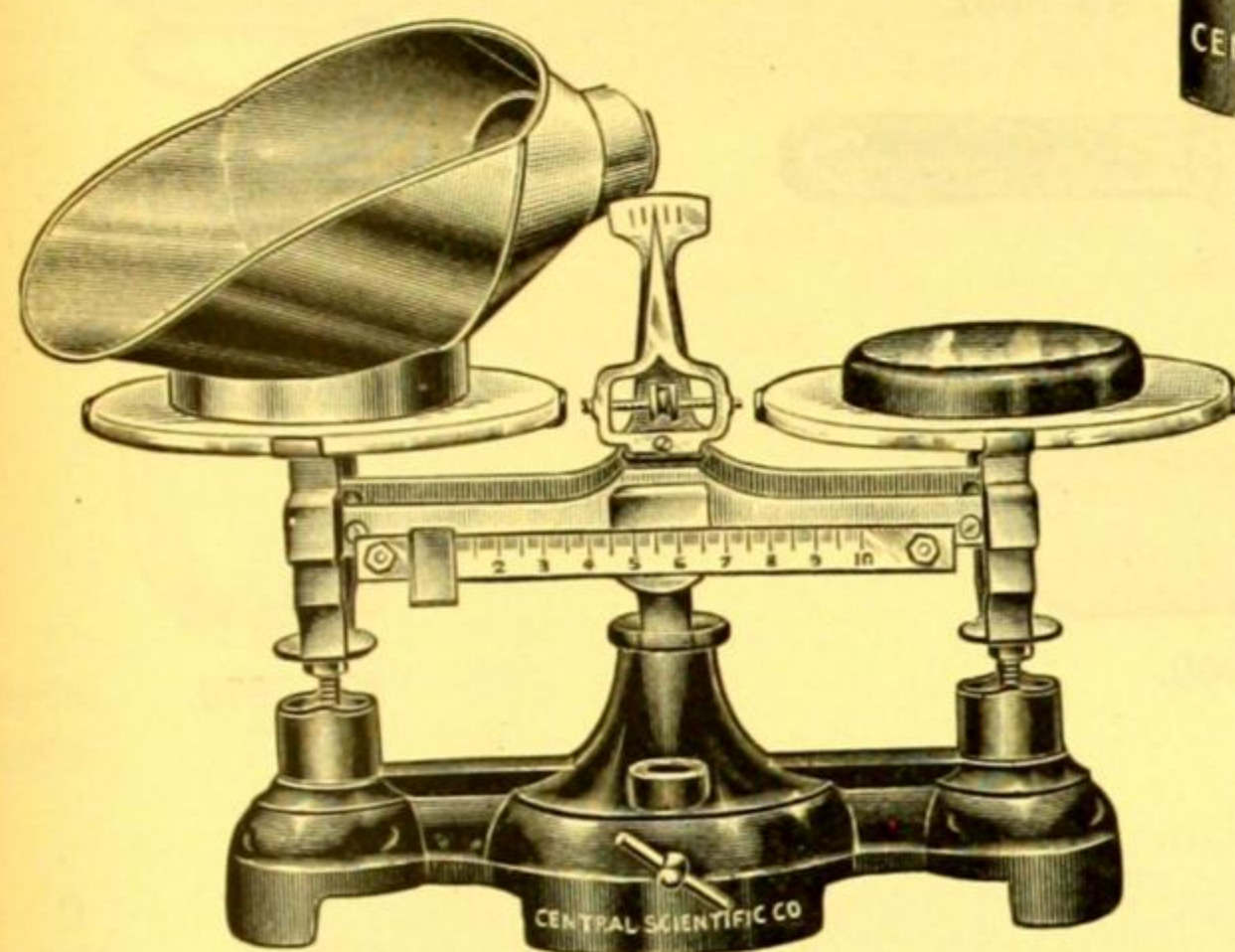
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No. 5906.



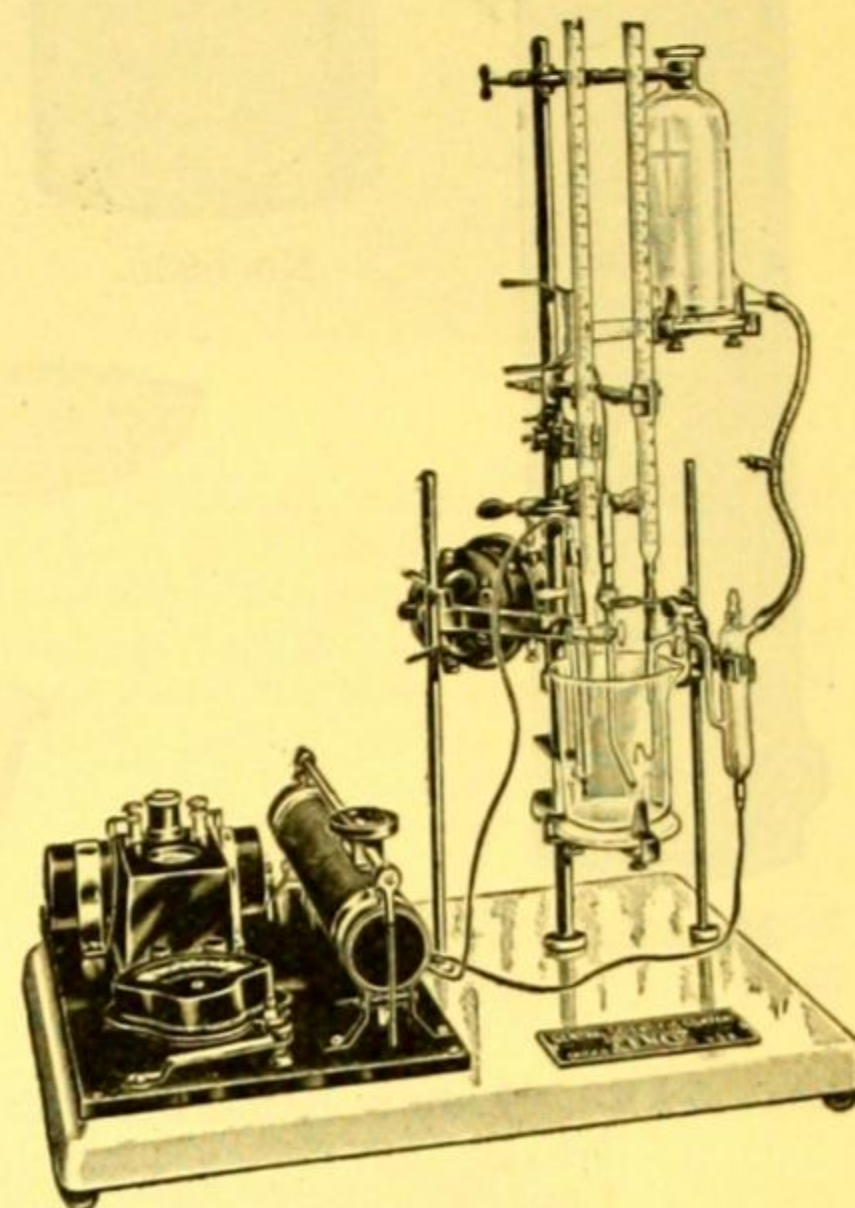
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No. 654.



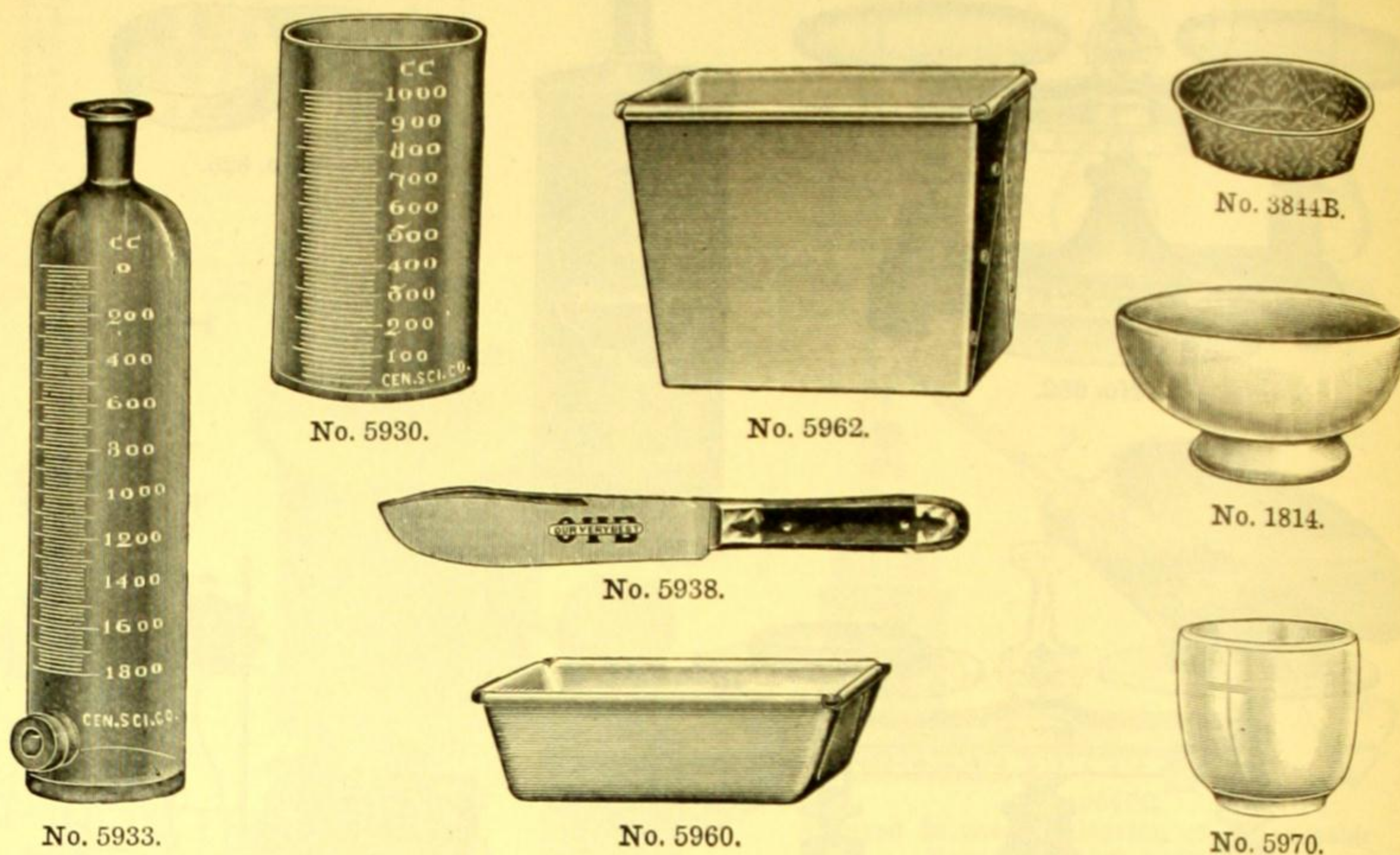
No. 5926.



No. 10312.

FLOUR TESTING APPARATUS

5906. **BAKING CYLINDERS**, as designed by the Columbus Laboratories, with graduated indicator and detachable cup for definite capacity. Two are desirable for comparative tests...each \$8.50
For Tongs for No. 5906 Baking Cylinders, see No. 6020.
BALANCE, Analytical, for Flour Testing, see Nos. 459, 471 and 487.
BALANCE, Porcelain Pan, for general use, see No. 648.
652. **BALANCE**, Baker's Scale, same as No. 648 with the exception of the scale pans which are of nicked brass, 15 cm in diameter, and of shallow pan style. The graduated beam has a range of 10 grams in $\frac{1}{10}$ gram divisions, and brass weights from 10 grams to 100 grams are supplied, conveniently fitted into a projecting holder. The capacity is 2,000 grams. Sensibility is guaranteed to be $\frac{1}{10}$ gram. Actual tests show a much greater sensibility..... 14.00
656. **FUNNEL SCOOP and Counterpoise**, accurately adjusted, for use with No. 648 Balance. Scoop holds approximately one kilogram of flour..... 4.00
654. **BALANCE**, Flour Test, consisting of No. 648 Balance with the addition of No. 656 Funnel Scoop and Counterpoise 15.00
826. **Weighing Scoops**, of aluminum, with large lip and counterpoise for use in weighing flour for protein tests; size B holds approximately 12 grams of flour, size C about 50 grams.
- | | A | B | C |
|--------------------------|------|------|------|
| No. | 10 | 30 | 125 |
| Capacity, about, cc..... | 1.50 | 1.80 | 2.00 |
- Each
- BALANCE WEIGHTS** for Flour Testing, see Nos. 718 and 734
BOTTLES, Sample, for Flour, see general heading **Bottles**.
CARBONIC ACID APPARATUS, for testing Baking Powder, see general heading **Carbon Dioxide Determination Apparatus**.
COLORIMETERS, for Bread and Flour Testing, see general heading **Colorimeters**.
EXTRACTION APPARATUS, see general heading **Extraction Apparatus**.
FLOUR CONTAINER, of galvanized iron, see **Bins and Containers**.
5926. **FLOUR SLICK**, of finest quality spring steel, highly polished and tapered to a thin flat edge. Size, $1\frac{5}{8} \times 6$ inches..... .70
- FURNACE**, Ashing, see general heading **Furnaces, Muffle**.
10312. **HYDROGEN ION CONCENTRATION APPARATUS**, for the determination of the Hydrogen Ion concentration (pH) in flour, as a means of studying the influence of aging, improving, bleaching and blending on the baking value. For the dough of any wheat flour there exists an optimum concentration of hydrogen ions with which the production of bread from this flour will be most successful. For complete description and accessories, see No. 10312.... 150.00
(See Journal of the American Association of Cereal Chemists for January, 1922, "Influence of the Concentration of Hydrogen Ions on the Baking Value of Flour" by H. Jessen-Hansen.)



5930. **JARS, Chidlow Expansion**, for testing the rising qualities of dough.

No.	A	B	C
Capacity, cc.	1000	2000	3000
Graduated in, cc.	20	50	50
Each	\$3.35	4.25	5.00

5932. **JAR, Chidlow Gas Collection**, graduated to 1800 cc in 20 cc divisions. Complete with accessory bottles, tubing and rubber stoppers. 11.25

5933. **JAR, Chidlow Gas Collection**, the graduated jar only of No. 5932. 9.00

JARS, Proofing and Dough Mixing, see **Jars, Stoneware**.

5938. **KNIFE** for mixing dough. Substantially made, with ebony handle and heavy hand forged steel blade 6 inches long.80

MAGNIFIERS for examining flour, bolting cloth, etc., see general heading **Magnifiers**.

MILLS for grinding wheat samples, see **Crushing and Grinding Apparatus**.

MOISTURE TESTERS for Flour, see No. 7360, etc.

NITROGEN DETERMINATION APPARATUS, see general heading **Nitrogen Determination Apparatus**.

OVENS, Baking, see general heading **Ovens**.

5960. **PANS, Baking**, sanitary, rounded corners and bottoms.

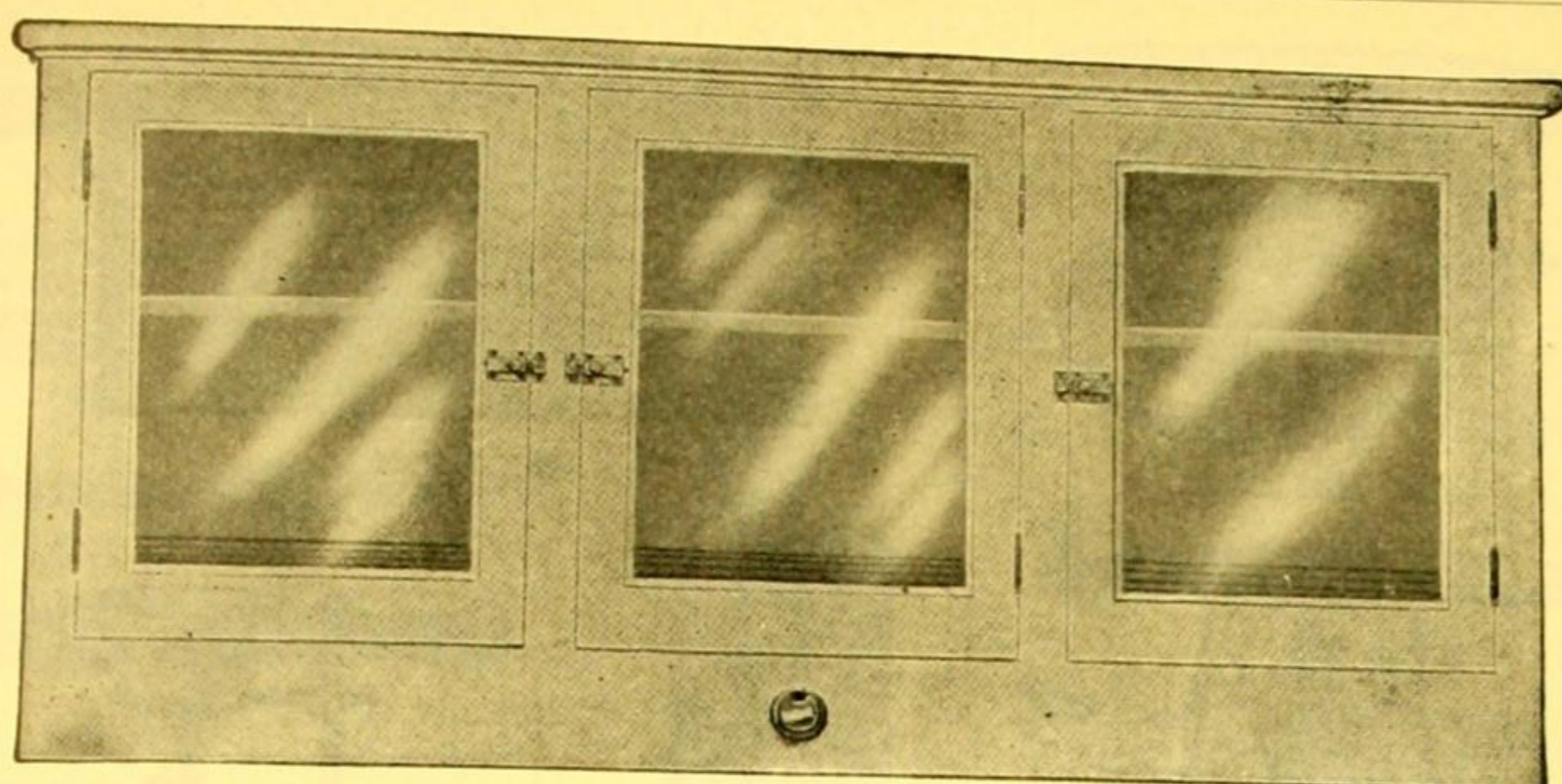
No.	A	B
Top inside, inches.	8½x4½	9½x5½
Bottom inside, inches.	7½x3½	8½x4½
Depth, inches.	2¾	3
Each	.25	.30
Per dozen	2.70	3.20

5962. **PANS, Baking**, laboratory type. Depth, 5⅝ inches; width at top, 3½ inches; at bottom, 2¾ inches; length at top, 6⅝ inches; at bottom, 5⅝ inches. each 1.10

3844B. **PAN, Washing**, of graniteware, round, with flat bottom, for use in washing out gluten from flour. Capacity one quart. per dozen 10.00

1814. **PORCELAIN BOWL** for use in washing out gluten, so-called pint size.40

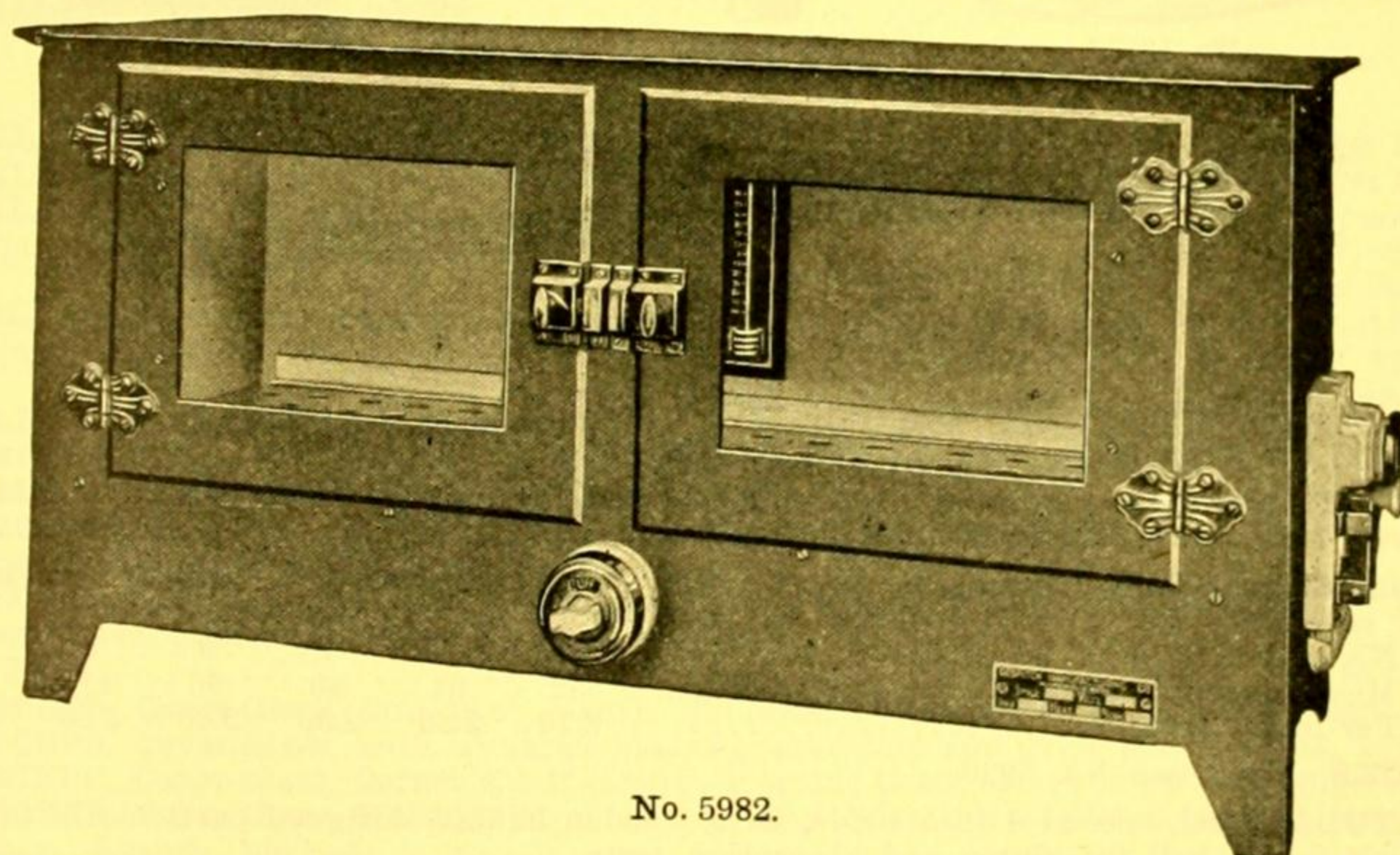
5970. **PORCELAIN CUP**, without handle, used in gluten washing and flour mixing.30



Nos. 5978-9.

PROOFING CABINETS, Despatch Electric, designed especially for dough raising in wheat and flour testing laboratories. They are made of kiln dried lumber, have glass doors, removable slat shelves, asbestos lined heater chamber and are equipped with Despatch Open Wire Electric Heaters. Heaters are controlled by a two-point regulating switch system by means of which heat can be held at any temperature desired. The cases are finished in white enamel and are complete with thermometers. All sizes are 28 inches high and 14 inches deep.

	Despatch No.....	520	524
	Length, inches	48	60
	Number of doors.....	2	3
5978.	For 110 volts.....	\$58.00	75.00
5979.	For 220 volts.....	58.00	75.00



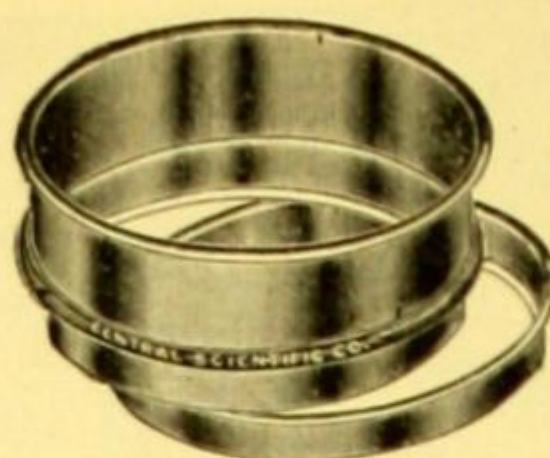
No. 5982.

5982. **PROOFING CABINETS for Test Baking, Despatch Electric**, of polished steel, with glass observation doors and Despatch Open Wire Heaters for one heat. The walls are lined with asbestos board. Length, 29 inches; depth, 11 inches; height, 10 inches; power consumption, 200 watts. Complete with snap switch and fused entrance switch. No. A B
- | | | |
|-----------------|-------|-------|
| For volts | 110 | 220 |
| Each | 30.00 | 30.00 |

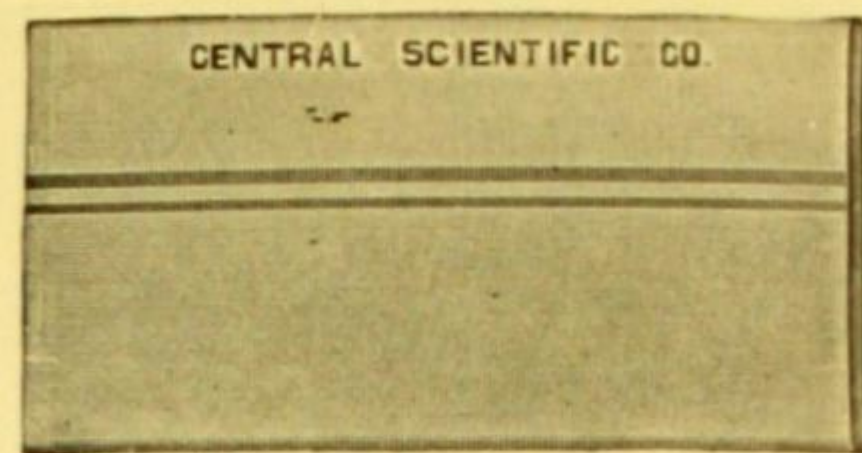
PROTEIN DETERMINATION APPARATUS, see general heading Nitrogen Determination Apparatus.

5988. **SAMPLE MAILING CASES**, of heavy cardboard with tin bottom and tin screw top. Thickly coated within with paraffine, with paraffined cardboard cap for top, so that the tube is air tight. Will not lose or take on moisture in transit. 2 inches in diameter by 5 inches long. Shipping labels included.....per 100 9.00
5989. **SAMPLE MAILING CASES**, same as No. 5988, but 1 3/4 inches in diameter and 7 1/8 inches long, will take a 4 oz. oil sample bottle.....each .12

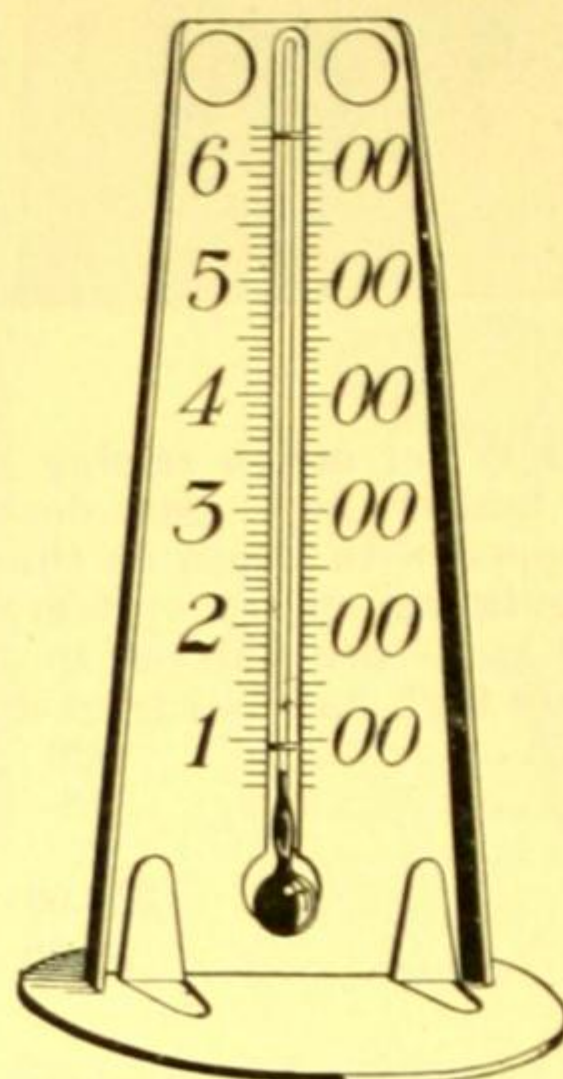
10% discount in lots of 12, 20% discount in lots of 144.



No. 12096.



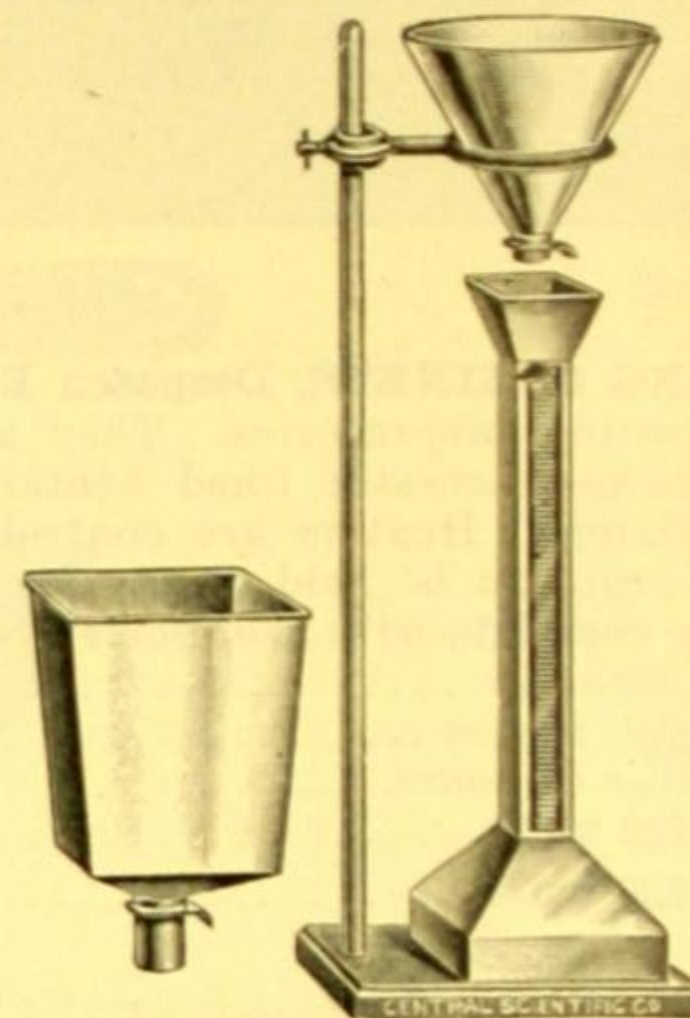
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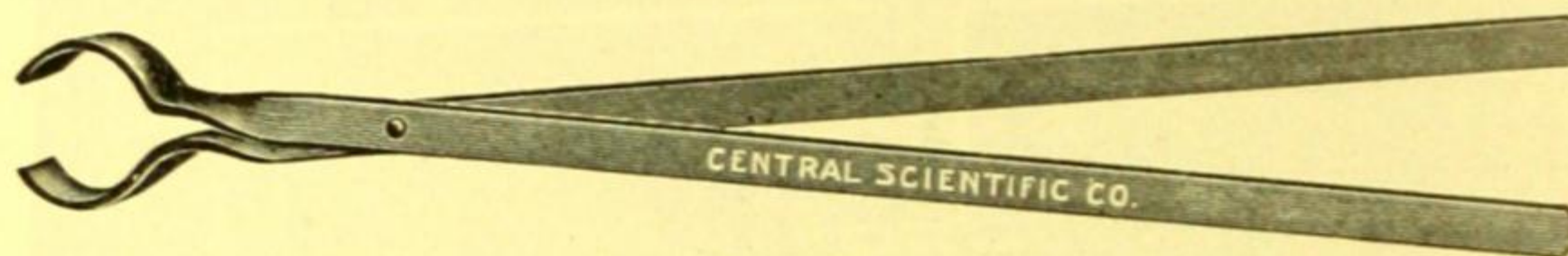
No. 13514.



No. 12580.



No. 6026.



No. 6020.

SCOOPS for Flour, see general heading **Scoops**.

SIEVES for Flour, see general heading **Sieves**.

12096. **SIEVE FRAME**, without bottom, but with brass ring for holding bolting cloth, 5 inches in diameter \$1.40

12098. **Bolting Cloth, Silk**, for making sieves, etc. The well known Anchor Brand. Standard weight, 40 inches wide.

No.	2	5	7	9	11	13	15
Mesh per linear inch.....	52	64	80	96	116	130	148
Per linear foot.....	2.10	2.30	2.50	3.00	3.50	4.00	4.50

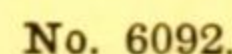
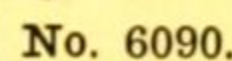
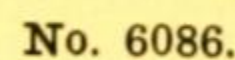
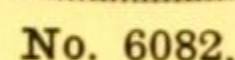
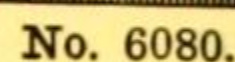
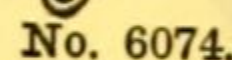
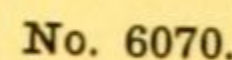
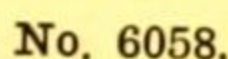
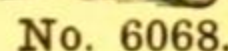
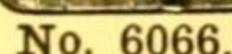
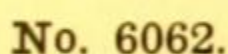
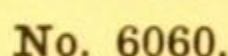
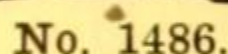
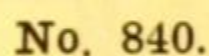
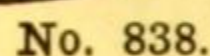
SLICKS, Flour, see No. 5926.

12580. **SPATULA**, Steel, special 4 inch blade, with wooden handle, designed particularly for mixing a small dough ball for gluten and absorption tests45
For other **SPATULAS**, see general heading **Spatulas**.

13514. **THERMOMETER**, Bake Oven, of glass with 5 inch flanged metal scale with white filled figures, mounted on round disk metal base with asbestos mat attached. Range 100° to 600°F... 2.00

6020. **TONGS**, Cylinder, for use with No. 5906 Baking Cylinder. Length, 24 inches, with special jaws 2.00

6026. **VOLUME OF LOAF APPARATUS**, for determining the volume of loaves of bread by displacement of seed. Consists of a vessel of known capacity, sufficiently large to contain loaves baked in Baking Pans Nos. 5960 and 5962, having an upright tube with graduated glass face and an auxiliary funnel. In use, the bread is placed in the first container, which is then filled level full with seed. The seed is then emptied into the auxiliary funnel, and from this funnel flows evenly into the measuring vessel. From the height to which the seed rises on the graduated face of this vessel, the volume of the loaf may be read directly without calculation. For most efficient operation the use of mustard, rape or millet seed is recommended. Of polished brass with suitable support, graduated in cubic centimeters for loaves ranging from 1500 to 3000 cc in volume..... 40.00



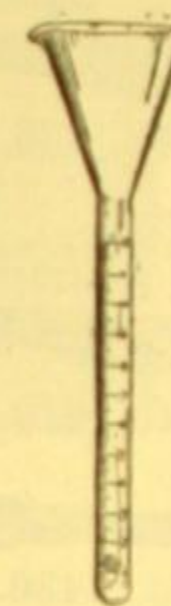
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No. 6100.



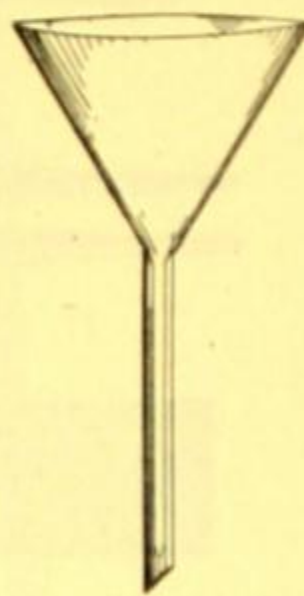
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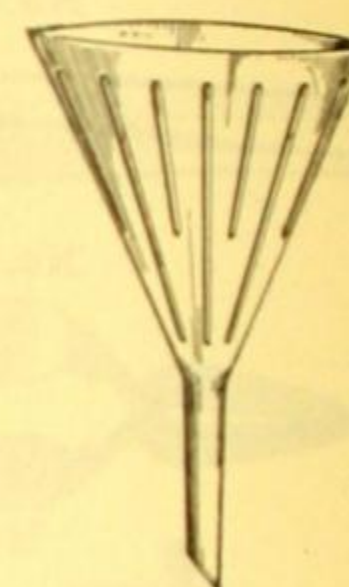
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No. 6112.



No. 6124.



No. 6126.

FUNNELS, ALL KINDS

6100. FUNNELS, Agateware.

No.	B	C	D	E
Capacity, pints	1	2	4	8
Diameter, inches	4 1/4	5 1/2	7 1/2	9
Each	.45	.50	.60	.80

6102. FUNNEL, Agateware, for pouring chemical salts into jars and wide mouth bottles. Size, 5 inches by 4 1/2 inches. .30

FUNNELS, Alundum Conical Filters, see Filtering Cones, Alundum.

6106. FUNNEL, Creosote, with stem graduated to 12 cc in 1/10 cc divisions, for estimating moisture in creosoted wood. (See Bulletin 134 of the Forest Service, United States Department of Agriculture) 1.80

6110. FUNNELS, Glass, with angle of 60°, with stem ground to a point.

Diameter, mm	50	65	75	90	100	125	150	200	250	300
Length of stem, mm	60	65	75	90	100	125	150	150	150	150
Capacity, about, cc	30	60	90	120	250	360	650	1800	3500	5000
Number in original case	120	70	100	80	60	40	30	30	10	10
Each	.23	.27	.31	.36	.40	.53	.67	1.05	2.00	2.65

10% discount in lots of 12, 20% discount in original cases.

6112. FUNNELS, Glass, Bunsen, with angle of 60°, for analytical filtrations, with ground rim and long slender stems ground to a point. Length of stem, about 150 mm.

Diameter, mm	40	50	65	75	90	100
Number in original case	210	120	70	100	80	60
Each	.25	.27	.34	.38	.42	.50

10% discount in lots of 12, 20% discount in original cases.

6124. FUNNELS, Glass Filter, so-called Carbon Filters, for use with Gooch crucibles.

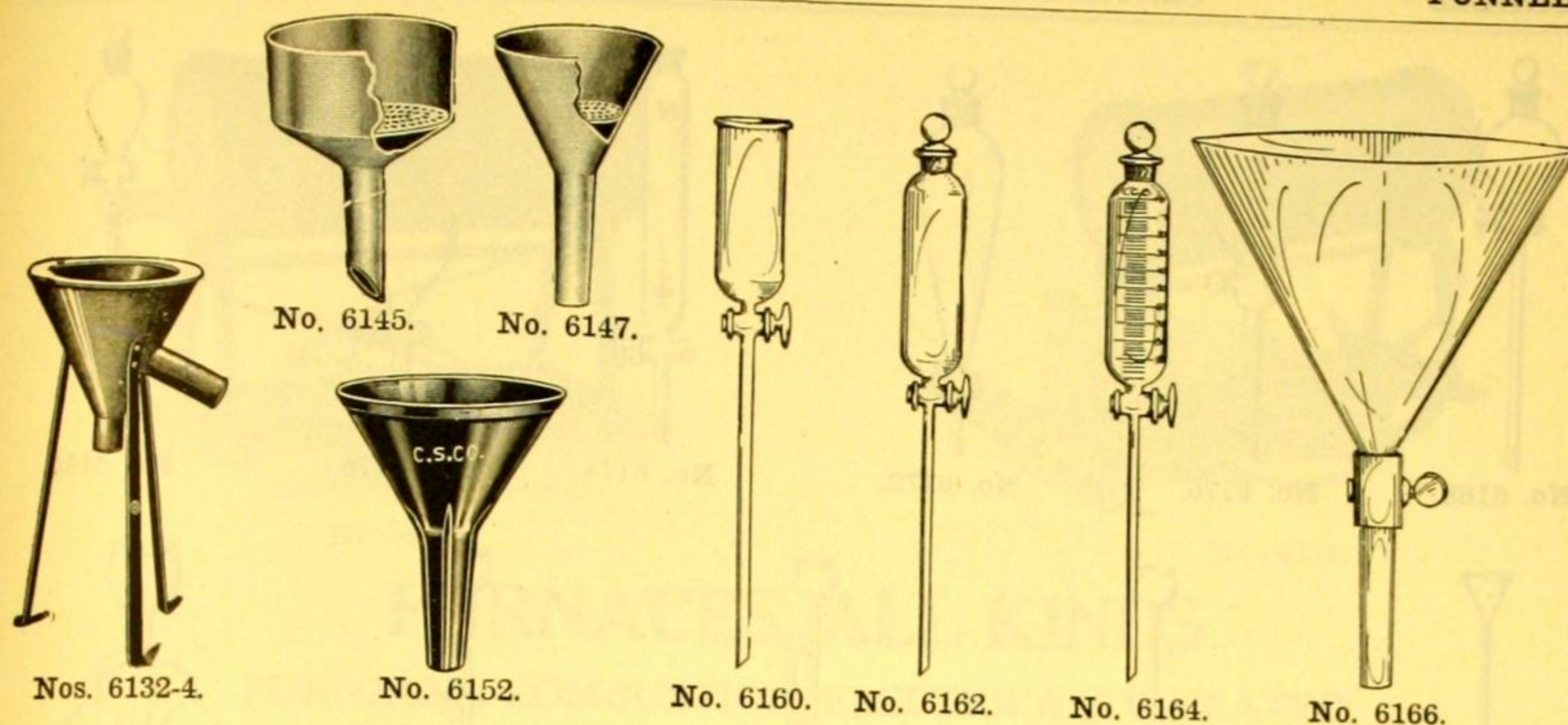
No.	A	B	C
Diameter at top inside, mm	25	30	35
For Gooch crucible, No.	2	3	4
Each	.25	.26	.30

10% discount in lots of 12.

6126. FUNNELS, Glass, Ribbed, for rapid filtering, of heavy molded glass with smooth rim.

Diameter, inches	3 3/4	4 3/4	5 3/4	7 1/4	8 3/4	10 1/4	13
Capacity, ounces	4	8	16	32	gals. 1 1/2	1	2
Each	.23	.30	.40	.60	.90	1.60	2.80

10% discount in lots of 12.



6132. FUNNEL, Hot Water, Koch's, of heavy polished copper, double walled, with detachable iron legs. Diameter inside, $5\frac{1}{2}$ inches. \$7.00
 6134. FUNNEL, Hot Water, Koch's, similar to No. 6132, but with single wall only. 5.00
 FUNNELS, Porcelain, Conical, perforated, see Filter Cones, Porcelain.
 6145. FUNNELS, Porcelain, Buechner's, glazed throughout with exception of rim, with straight sides and fixed perforated plate.

No.	A	B	C	D	E	F	G	H
Diameter, outside, mm.	48	66	82	102	122	138	163	200
Diameter, inside, mm.	42	60	75	95	115	130	155	190
Diameter, perforated area, mm.	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm.	76	100	140	165	195	215	234	280
Length of tube, mm.	46	50	70	80	90	100	110	130
Diameter of tube, mm.	14	8	9	12	14	16	18	20
Each	.90	1.08	1.80	2.34	2.52	4.32	5.04	6.48

10% discount to commercial institutions, 15% discount to educational institutions for orders amounting to \$100.00 or above.

6147. FUNNELS, Porcelain, Hirsch's, glazed throughout with exception of rim, with conical sides and fixed perforated plate.

No.	A	B	C	D	E
Diameter top, mm.	54	50	75	92	103
Diameter perforated area, mm.	16	28	28	28	28
Distance rim to perforated plate, mm.	26	12	18	33	41
Height over all, mm.	66	61	95	121	131
Length of tube, mm.	34	30	41	52	56
Diameter of tube.	12	10	10	12	14
Each	.72	.72	.90	1.08	1.44

10% discount to commercial institutions, 15% discount to educational institutions for orders amounting to \$100.00 or above.

6152. FUNNELS, Hard Rubber, polished, with corrugated spout to allow escape of air.

No.	A	B	C	D
Diameter, inches	$3\frac{1}{4}$	$4\frac{1}{4}$	5	6
Capacity, ounces	4	8	16	24
Each	.55	.85	1.10	1.20

6160. FUNNELS, Separatory, cylindrical, open top, with glass stop-cock and long stem.

No.	B	C	D
Capacity, cc.	60	125	250
Each	1.00	1.35	1.55

10% discount in lots of 12.

6162. FUNNELS, Separatory, cylindrical, same as No. 6160, but with ground in glass stopper.

Capacity, cc.	60	125	250
Each	1.10	1.40	2.00

10% discount in lots of 12.

6164. FUNNELS, Separatory, cylindrical, same as No. 6162, but graduated in cc.

Capacity, cc.	125	250
Each	2.10	3.35

10% discount in lots of 12.

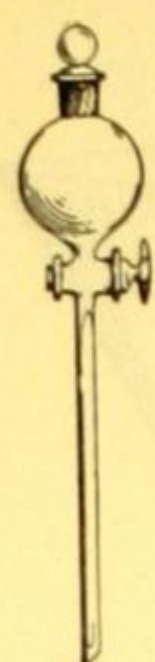
6166. FUNNELS, Separatory, funnel shape, 60° angle, of heavy glass, with glass stop-cock.

Diameter, mm.	100	150	200
Capacity, about, cc.	250	650	1800
Each	2.70	3.50	4.00

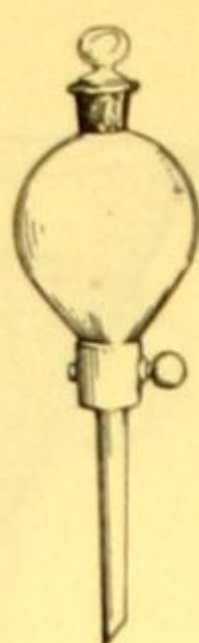
10% discount in lots of 12.

FUNNELS

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 6168.



No. 6170.



No. 6172.



No. 6174.



No. 6176.



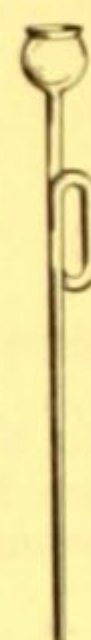
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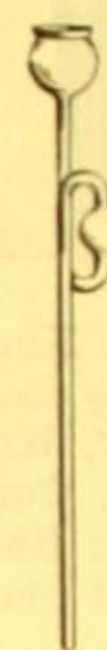
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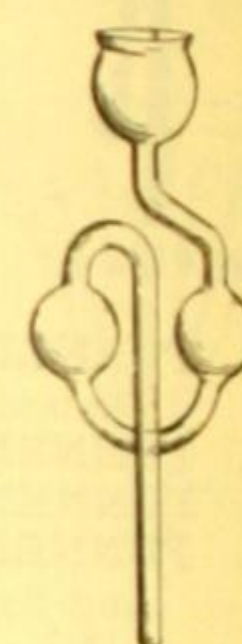
No. 6194.



No. 6196.



No. 6198.



No. 6200.

6168. **FUNNELS, Separatory, globe shape, light glass, with ground glass stopper, stop-cock and long stem.**

Capacity, cc.....	30	60	125	250	500	1000	2000
Each	\$1.00	1.10	1.35	1.65	2.00	3.00	5.00

10% discount in lots of 12.

6170. **FUNNELS, Separatory, globe shape, of heavy molded glass with glass stopper, stop-cock and short stem.**

Capacity, cc.....	500	1000	2000	4000
Each	3.50	4.50	6.00	8.35

6172. **FUNNELS, Separatory, Squibb's, pear shape, with ground in glass stopper.**

Capacity, cc.....	125	250	500
Each	1.50	2.10	2.60

10% discount in lots of 12.

6174. **FUNNEL, Separatory, Straus, for the estimation of lactic acid in gastric juice; with glass stop-cock. Capacity about 30 cc, with marks at 5 cc and 25 cc.....**

1.30

10% discount in lots of 12.

6176. **FUNNEL, Separatory, for sulphonation test of creosote, with neck graduated to 5 cc in $\frac{1}{10}$ cc divisions. Capacity, 125 cc. (See Circular 112 of Forest Service, United States Department of Agriculture).....**

3.00

6180. **FUNNEL, Separatory, Walter's, for delivering single drops. With ground glass stopper and glass stop-cock. Capacity, 60 cc.....**

2.00

6192A. **FUNNEL TUBE, conical top, straight stem. Length, 30 cm.....**

.15

6194. **FUNNEL TUBES, thistle top, straight stem.**

No.	A	B
Length, cm.....	30	40
Each	.12	.15

10% discount in lots of 12, 20% discount in lots of 144.

6196. **FUNNEL TUBE, thistle top, with bend in stem for safety trap. Length, 30 cm.....**

.20

10% discount in lots of 12, 20% discount in lots of 144.

6198. **FUNNEL TUBES, thistle top, with bend and bulbs. Length, 30 cm.**

No.	A	B
Number of bulbs.....	1	2
Each	.25	.35

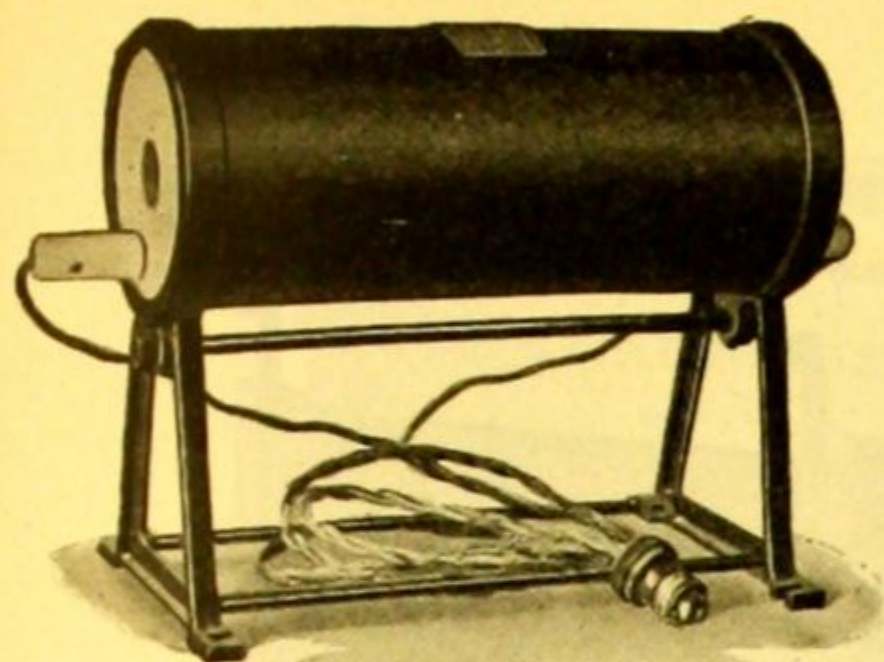
10% discount in lots of 12, 20% discount in lots of 144.

6200. **FUNNEL TUBE, heavy, short stemmed, with bend and two bulbs, for use with gas generators.....**

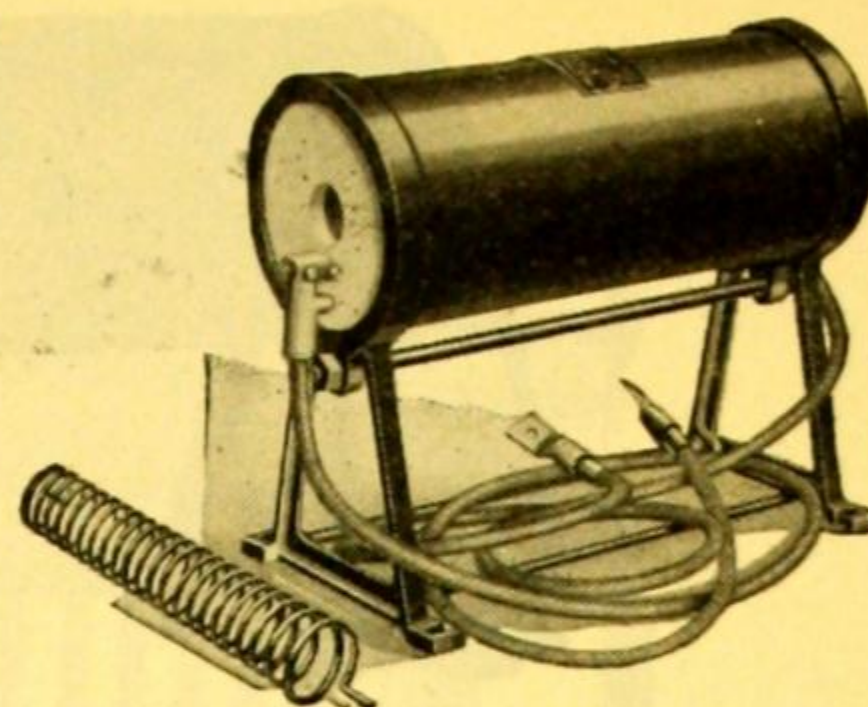
.45

10% discount in lots of 12, 20% discount in lots of 144.

FUNNEL SUPPORTS, see Supports.



No. 6210.



No. 6218.

FURNACES, ALL KINDS

FURNACES, COMBUSTION, ELECTRICALLY HEATED

FURNACES, Combustion, Hoskins Electric, Type FD, for use at temperatures up to a maximum of 1000°C. The heating element is of Chromel wire, wound in spiral grooves upon a special refractory tube $1\frac{1}{4} \times 12$ inches inside, and is surrounded by special packing material of high heat-insulating qualities. The element can be easily renewed by the user when burned out. Resistance wire is furnished in the proper length in spiral coils ready to be wound in the grooves upon the refractory tube. The entire renewal requires but a few minutes time and can be made if necessary while the tube is hot. **A rheostat should be used to control the temperature within safe working limits.** The furnace operates on either A. C. or D. C. with a maximum consumption of 550 watts. Widely used for determining carbon in iron and steel by the combustion method of Vanier, Johnson and others. With connecting cord and plug.

No.	A	B
For volts	110	220
6210. Furnace only	\$26.00	26.00
6211. Furnace with rheostat	37.00	37.00
6212. Rheostats for use with No. 6210 to control temperatures within safe working limits.		
No.	A	B
For volts	110	220
Total resistance, ohms	10	40
Each	11.00	11.00

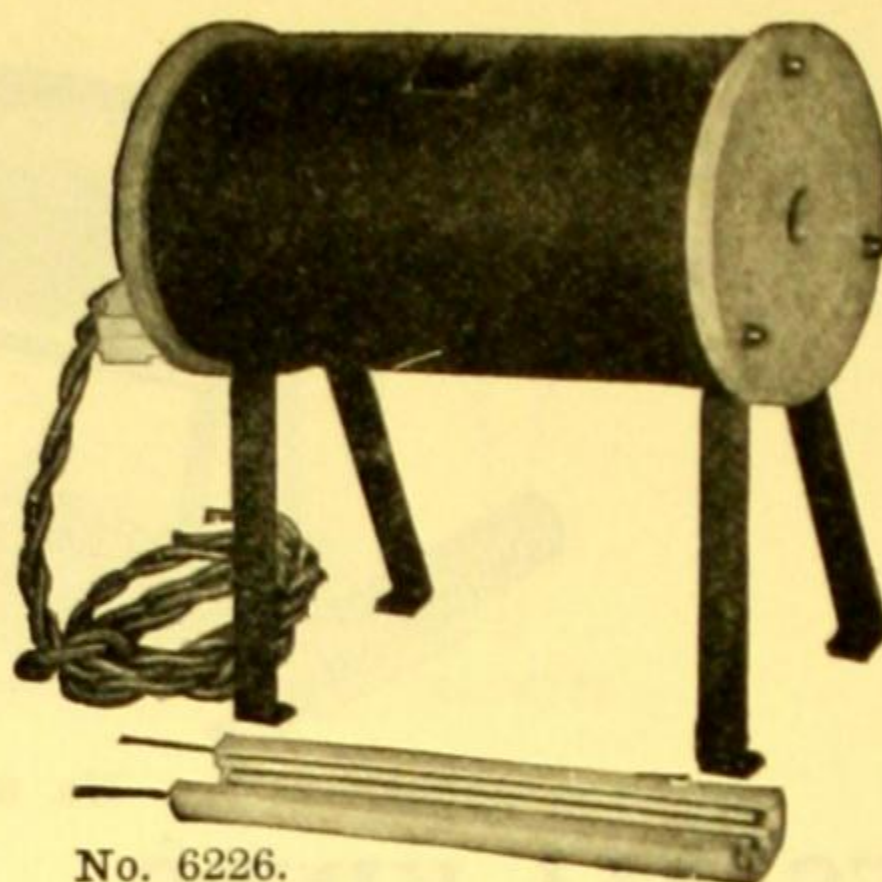
Repair Parts for Furnace No. 6210.

6213.	Refractory Tube only, without wire.....		5.50
6214.	Chromel Wire for rewinding.		
	No.	A	B
	For volts	110	220
	Each	2.75	2.75

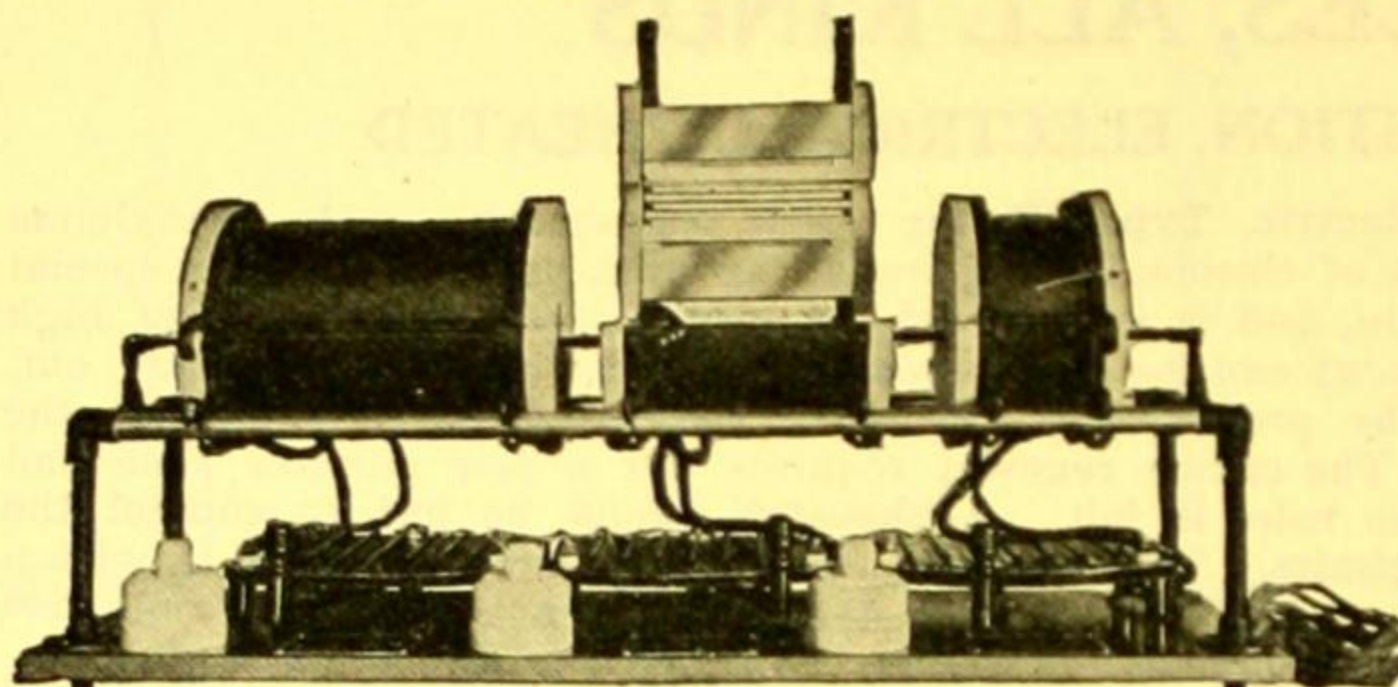
FURNACES, Combustion, Hoskins Electric, Type FB, for use at temperatures up to a maximum of 1100°C., for continuous operation. The heating element is a spiral of heavy Chromel wire, which radiates heat directly upon the combustion tube, enabling the furnace to be brought from cold to 1100°C. in only 30 minutes. As these furnaces operate on low voltages, they are best adapted for use on alternating currents in connection with a transformer. **The temperature should be kept within the safe working limits by means of a rheostat.** The element can be readily removed and replaced by the user in a few minutes in case of a burn out. Maximum power consumption, 1000 watts. Length of furnace, 12 inches; inside diameter of tube, $1\frac{1}{4}$ inches. Complete with connecting cord.

No.	A	B
For volts	110	220
6218. Furnace only	28.00	28.00
6219. Furnace with rheostat and transformer for 60 cycles	67.50	67.50
6220. Rheostats for use with No. 6218.		
No.	A	B
For volts	110	220
Each	12.50	12.50
6221. Heating Elements for No. 6218.		
No.	A	B
For volts	110	220
Each	4.00	4.00

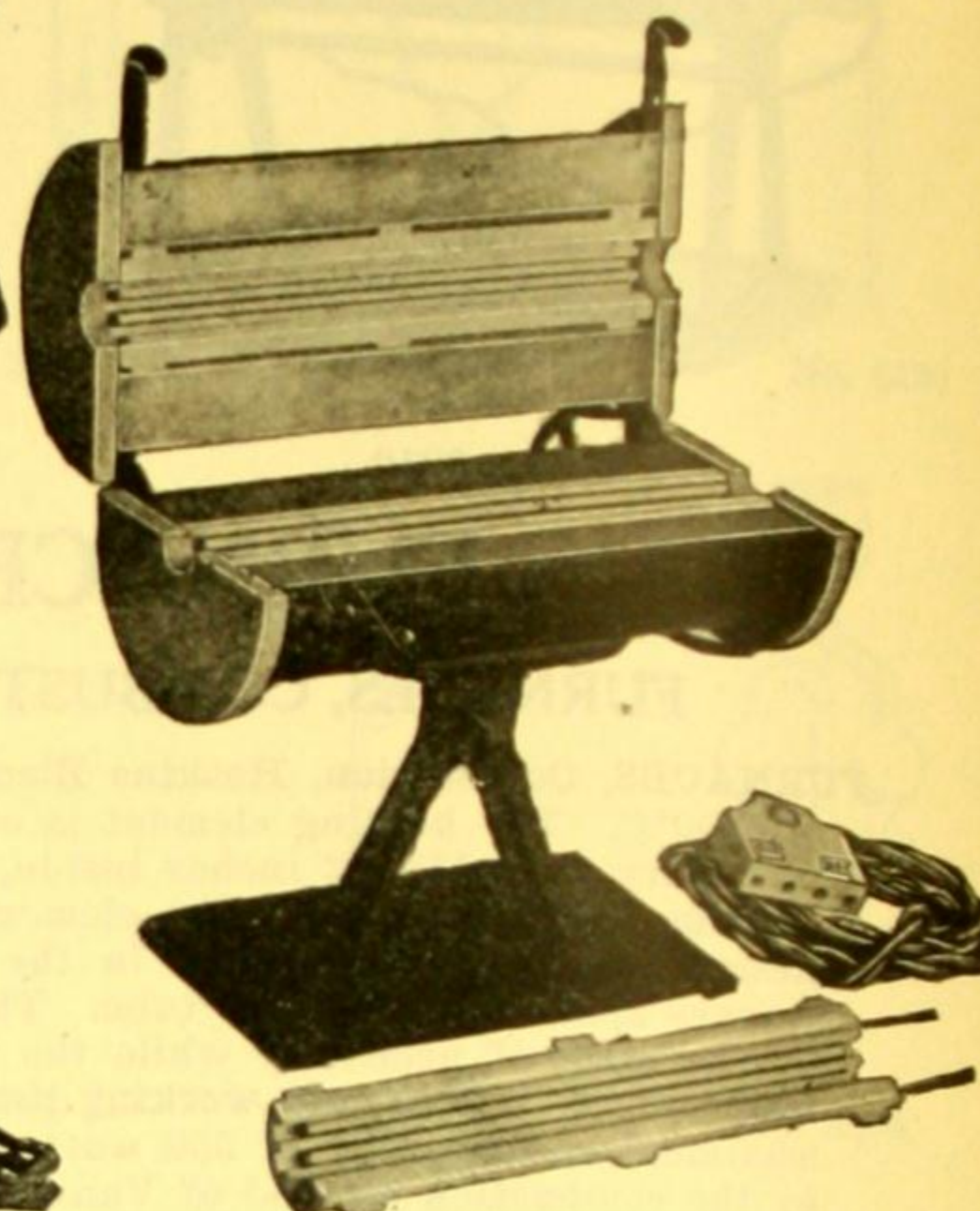
Note: The use of a Pyrometer with the above furnaces is desirable, as it will enable the operator to know at all times the exact temperature within the furnace chamber. For description, see general heading **Pyrometers**.



No. 6226.



No. 6246.

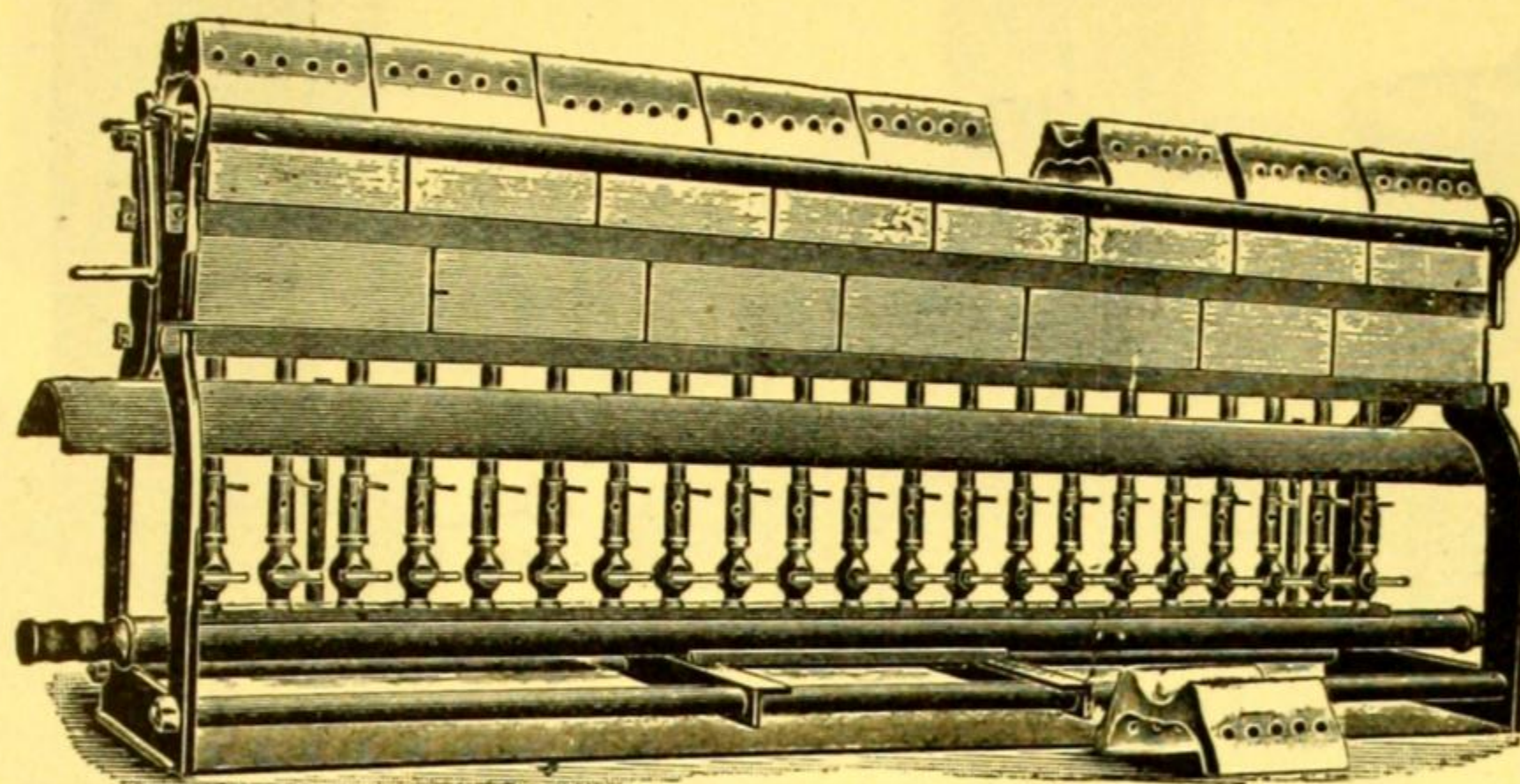


No. 6234.

FURNACE, Combustion, Multiple Unit Electric, with tube $1\frac{1}{4} \times 12$ inches. The heating element is made up of two units with spiral coils in longitudinal grooves, either of which may be easily replaced by the user when burned out. Widely used for carbon determinations in iron and steel, heat treatment of small rods or tubes, and for Pyrometer calibration. Can be used interchangeably on 110 or 220 volts A. C. or D. C., by means of a selective plug supplied with the furnaces. A rheostat should be used to control the temperature within safe working limits. Maximum power consumption, 560 watts. Complete with six feet of flexible cord and connecting plug. Height over all, 10 inches; shipping weight, 25 pounds.

6226.	Furnace only				\$30.00
6227.	Furnaces, same as No. 6226, but with rheostat No. 6233.				
	No.		A	B	
	With rheostat No.		6233A	6233B	
	For volts.		110	220	
	Each		36.00	36.00	
6228.	Heating Units for No. 6226, wound ready for use			each	3.50
6233.	Rheostats only of No. 6227 Furnace.				
	No.		A	B	
	For volts.		110	220	
	Each		10.00	10.00	
	FURNACE, Combustion, Multiple Unit Electric, Hinged Design , permitting inspection of combustion tube at any time without removing the same or disconnecting the train. Operates interchangeably on 110 or 220 volts A. C. or D. C. Rheostats should be used to control the temperature within safe working limits. Maximum power consumption, 750 watts. Shipping weight, 33 pounds. Height of furnace to center, $9\frac{1}{2}$ inches; length, 12 inches; inside diameter of tube, $1\frac{1}{4}$ inches.				
6234.	Furnace only				42.50
6235.	Furnaces, same as No. 6234, but with rheostat No. 6239.				
	No.		A	B	
	With rheostat No.		6239A	6239B	
	For volts.		110	220	
	Each		54.50	54.50	
6236.	Heating Units for No. 6234, wound ready for use			each	4.75
6239.	Rheostats only of No. 6234 Furnace.				
	No.		A	B	
	For volts.		110	220	
	Each		12.00	12.00	

Note: The use of a Pyrometer with the above furnaces is desirable, as it will enable the operator to know at all times the exact temperature within the furnace chamber. For description, see general heading **Pyrometers**.



No. 6262.

6246. **FURNACES, Organic Combustion, Multiple Unit Electric**, consisting of three sections, each of which can be moved along the rails for use at different points and is operated independently by means of its switch and rheostat on the base. The upper half of each section can be raised independently for inspection without disconnecting the current. The heating units are in two sections, either of which may be easily and quickly replaced by the operator in case of a burn out. A temperature of 1000° C. can be reached in 40 minutes and held constant indefinitely by means of the rheostat. Rapid cooling is obtained by raising the upper section. The life of the heating elements is about 1000 hours at temperatures not exceeding 1100°C. The trough for supporting the combustion tube is of pure nickel supported at the ends and is free from contact with the furnace. Lengths of the three sections 4, 8 and 12 inches respectively; inside diameter of tube space, 1¼ inches; lateral adjustment of each furnace, 11½ inches; distance from bench to center of furnace, 9 inches; length of combustion tube required, 48 inches; total length of base, 42 inches; width of base, 9½ inches; height of furnace over all closed, 12¼ inches; height over all open, 17½ inches; shipping weight, 135 pounds. (For illustration, see preceding page.)

No.	A	B
For volts	110	220
Each	\$175.00	175.00

Heating Units for No. 6246 (two required for each section).

No.	A	B	C
For section	small	medium	large
6249. For 110 volts, each.....	4.00	4.75	5.25
6250. For 220 volts, each.....	4.00	4.75	5.25

FURNACES, COMBUSTION, GAS HEATED

6262. **FURNACES, Combustion, Glaser's, improved form.** Provided with mica plates for watching the flame during combustion. The row of burners is movable in a furrow; the burners are provided with stop-cocks with separate long-handled key for turning and with nickel-plated air regulators. Complete with top plates of clay.

No.	A	B	C	D
Length, inches	14½	23	30	37
Number of burners.....	10	16	21	26
Each	54.00	64.00	76.00	85.00

6264. **FURNACES, Combustion, Glaser's, same as No. 6262, but for gasoline gas.**

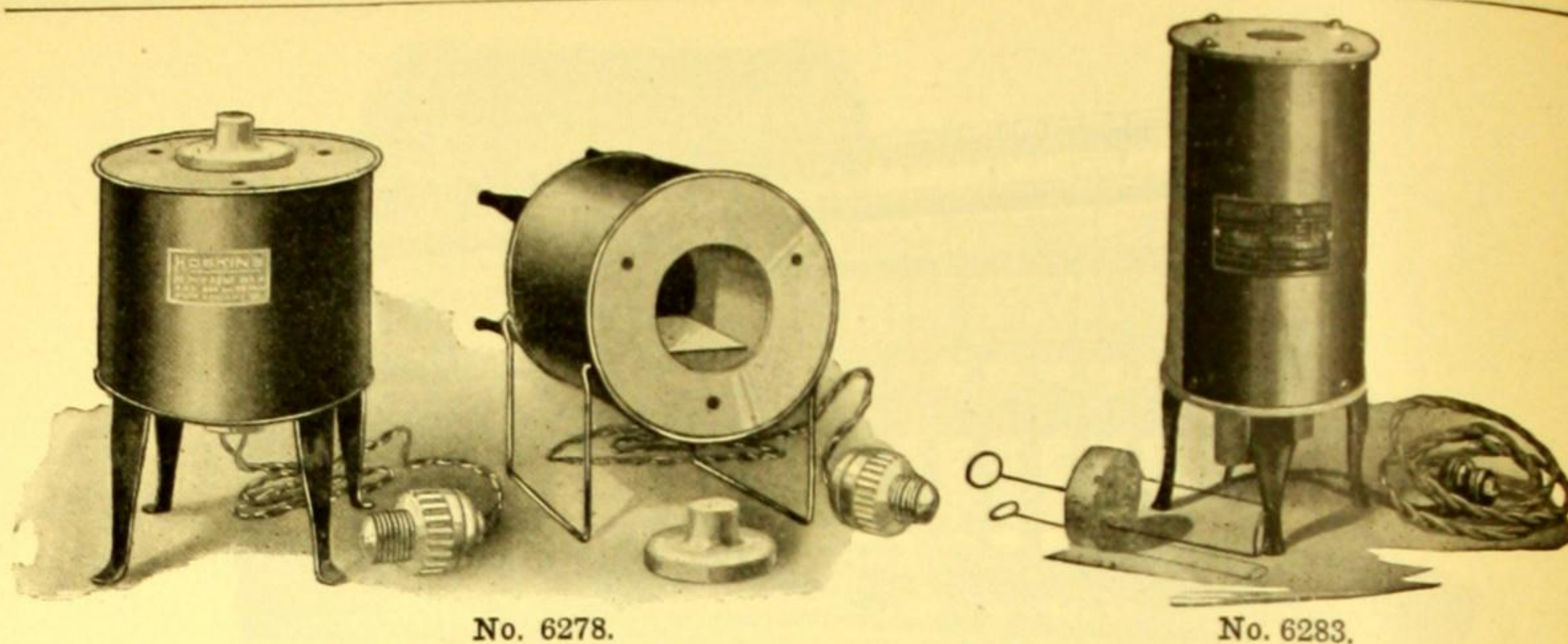
No.	A	B	C
Number of burners.....	10	16	21
Each	64.00	74.00	86.00

6265. **Extra Top Clays for Nos. 6262 and 6264.....** each .60
per dozen 6.00

6266. **Extra Side Clays for Nos. 6262 and 6264.....** each .20
per dozen 2.15

6267. **Extra Gutters for Nos. 6262 and 6264.....** each .12
per dozen 1.30

FURNACE, Simple Combustion, see No. 2066.



No. 6278.

No. 6283.

FURNACES, CRUCIBLE, ELECTRICALLY HEATED

FURNACES, Combined Crucible and Muffle, Hoskins Electric, Type FD, with crucible chamber 2 inches in diameter by 2½ inches deep. Can be heated from room temperature to 1000°C. in 30 minutes. **Temperature should be kept within safe working limits by means of a rheostat.** Requires no special wiring as furnace may be connected directly to lamp socket. Maximum power consumption, 370 watts. The heating unit is easily rewound by user in case of burn out, as the refractory is spirally grooved, and the resistance wire is furnished in a spiral coil ready to wind in the grooves. The entire renewal requires but a few minutes. Complete with connecting cord and plug. Shipping weight, 22 pounds.

No.	A	B
For volts	110	220
6278. Furnace only	\$25.00	25.00
6279. Furnace with rheostat	36.00	36.00

Note:—Larger furnaces of the same type as No. 6278 can be supplied on short notice, but are not carried in stock. Send for special bulletin on Electric Furnaces.

6280. Rheostats, for use with No. 6278, to control the temperature within safe working limits.		
No.	A	B
Voltage	110	220
Resistance, ohms	26.2	105
Each	11.00	11.00

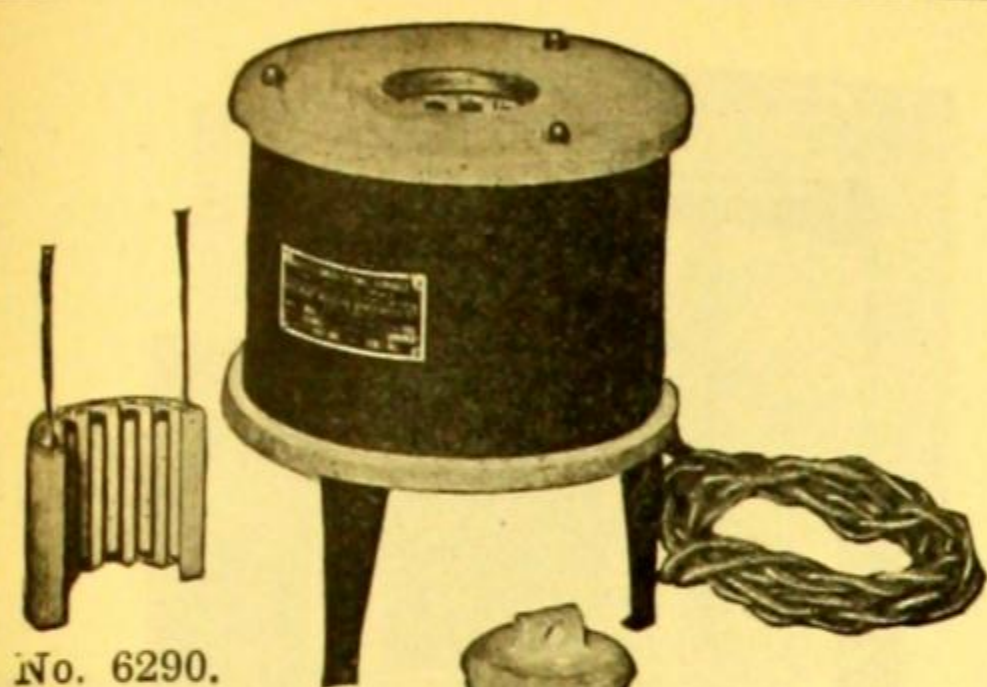
6282. Chromel Wire only for No. 6278, for rewinding.		
No.	A	B
For volts	110	220
Each	1.50	1.50

FURNACES, Crucible, Fieldner Electric, for the determination of volatile matter in coal. Adopted as standard by the American Chemical Society and the American Society for Testing Materials. The heating chamber is a cylindrical tube 1½ inches in diameter by 6 inches deep, wound with chromel wire to within 2 inches of the top and surrounded by insulation. A cover is provided, equipped with a chromel wire handle and furnished with a wire loop on the under side into which the crucible fits securely. This loop extends into the furnace to a depth of 4 inches. A hole is provided in the bottom of the furnace for the insertion of a thermocouple. The specified temperature of operation is 950 degrees Centigrade, although duplicate determinations made at temperatures anywhere from 950° to 1000° C. agree within 0.5%. Complete with attachment cord and plug for lamp socket. (See Bulletin No. 85, United States Bureau of Mines; Journal of Industrial and Engineering Chemistry, Vol. IX, No. 1, for January 1917, page 102; Tentative Standard No. D37-16T, of the American Society for Testing Materials.)

No.	A	B
Volts	110	220
6283. Furnace only	50.00	50.00
6284. Rheostat for No. 6283	12.00	12.00
6286. Renewal wire for No. 6283	1.50	1.50

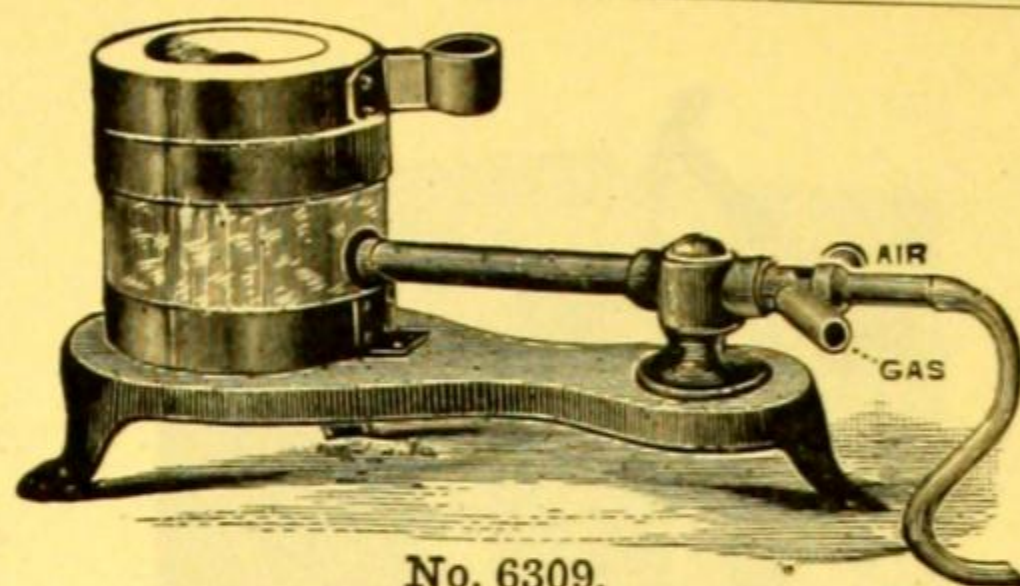
FURNACES, Crucible, Multiple Unit Electric, for temperatures up to 1000°C., for continuous duty. Adapted for melting metals, for determining the decalescent point of steel, and for calibrating pyrometers. Can be brought from cold to 1000°C. in 30 minutes. **The temperature should be kept within safe working limits by means of a rheostat.** The heating element is in two units, either of which may be quickly replaced by the operator if burned out. Furnace No. 84 operates interchangeably on 110 and 220 volts. No. 80 is made for either voltage, but must be used with rheostat when ordered for 220 volts.

(Continued on next page.)

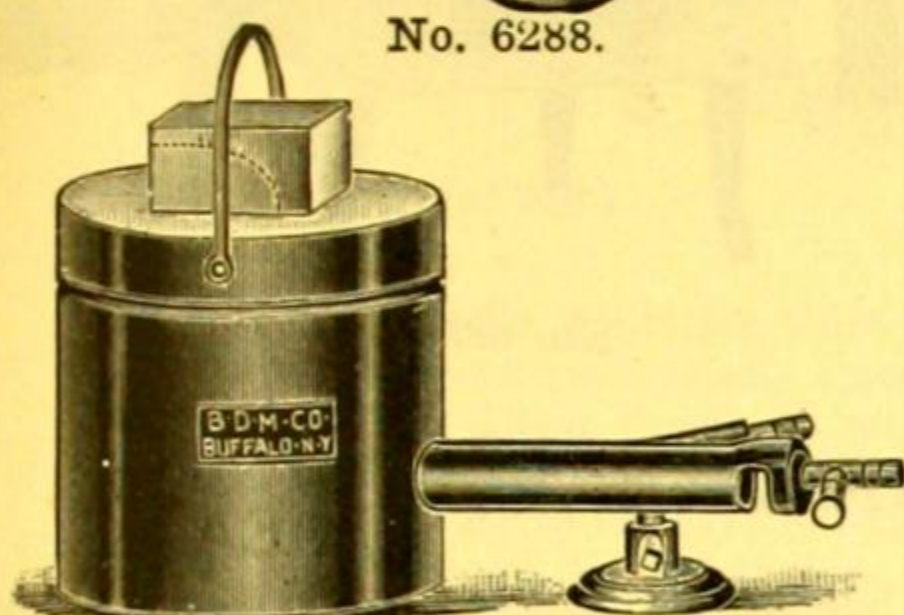


No. 6290.

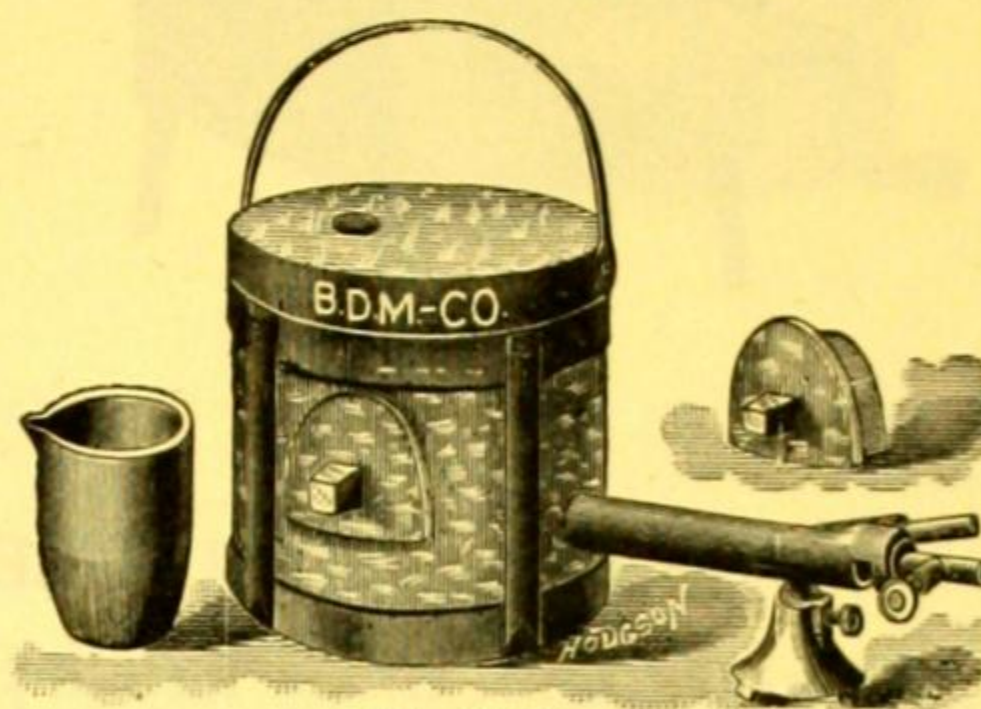
No. 6288.



No. 6309.



No. 6322.



No. 6328.

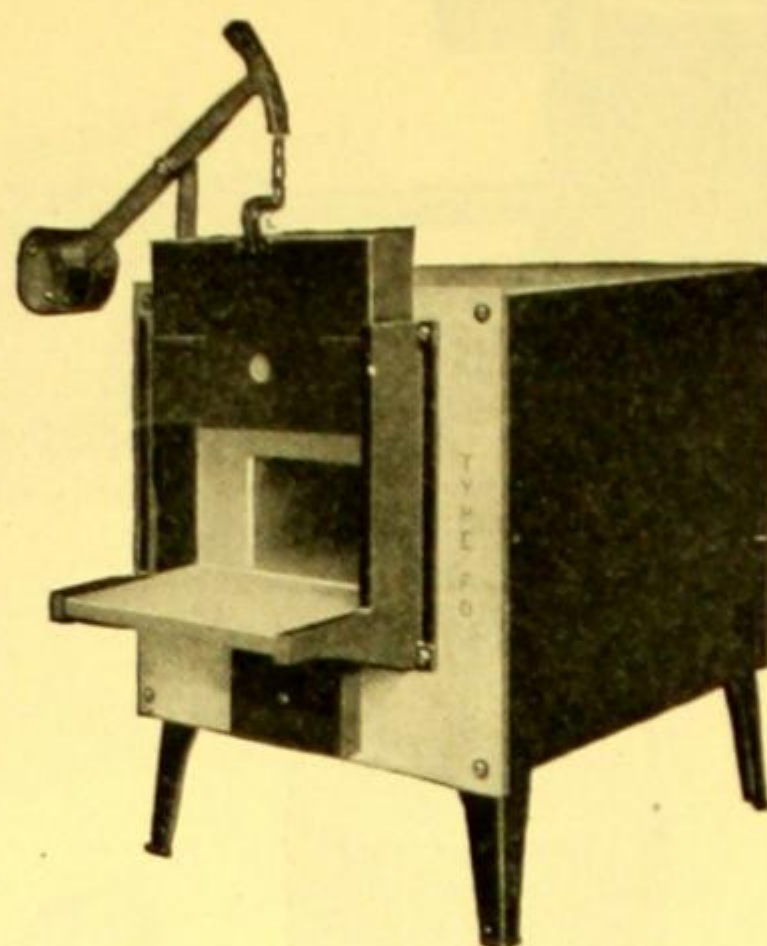
FURNACES, Crucible, Multiple Unit Electric—Continued.

No.	80A	80B	84E	84F
For volts	110	220	110	220
Diameter inside, inches	2 $\frac{3}{8}$	2 $\frac{3}{8}$	3	3
Depth inside, inches	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
Diameter over all, inches	7 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{3}{4}$	8 $\frac{3}{4}$
Height over all, inches	8 $\frac{1}{2}$	8 $\frac{1}{2}$	11	11
Rating of current for 110 volts, amperes	3.55	....	5.0	5.0
Rating of current for 220 volts, amperes	....	3.55	2.5	2.5
Maximum power consumption, watts	390	780	550	550
Shipping weight of furnace, lbs.	16	16	25	25
Shipping weight with rheostat, lbs.	20	30	29	29
6288. Furnace only	25.00	25.00	37.50	37.50
6289. Furnace with rheostat No. 6293	35.00	37.00	49.50	49.50
6290. Heating units wound ready for use, each	2.75	2.75	4.00	4.00
6293. Rheostat only	10.00	12.00	12.00	12.00

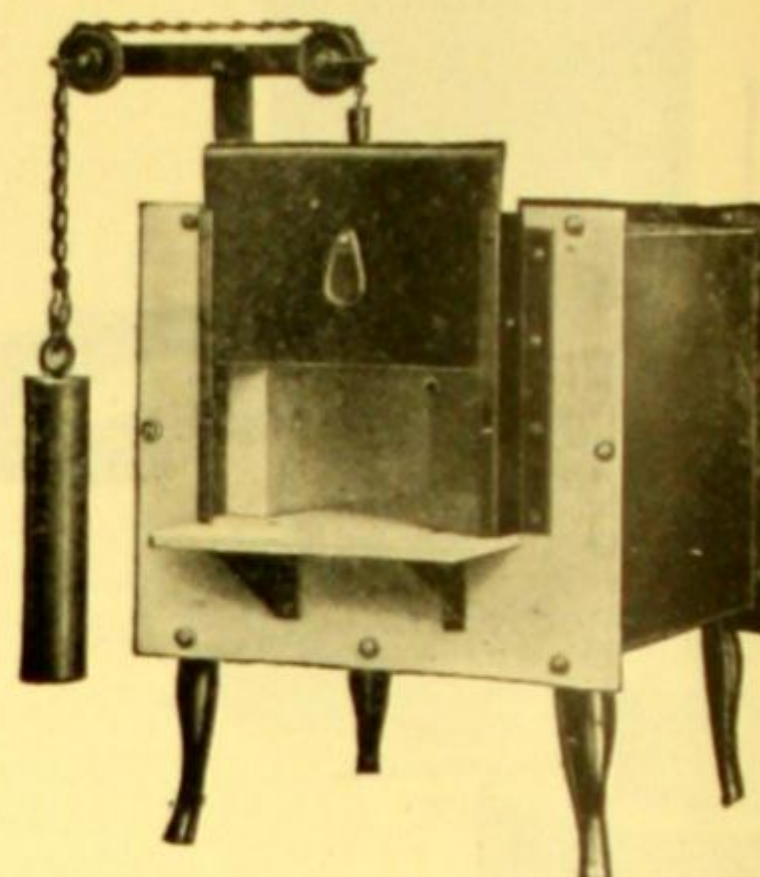
Note:—The use of a Pyrometer with the above furnaces is desirable, as it will enable the operator to know at all times the exact temperature within the furnace chamber. For description, see general heading **Pyrometers**.

FURNACES, CRUCIBLE, FOR GAS

6309. **FURNACE, Crucible, Fletcher's No. 40A**, consisting of a crucible pot with lid and blowpipe mounted on cast iron base, with injector burner. Operates on $\frac{3}{8}$ inch supply of coal, gasoline or natural gas, using a 9A or 10A Foot Blower No. 1374 or 1376. Gas consumption, about 24 cubic feet per hour. Diameter of crucible pot, 4 $\frac{1}{8}$ inches; height of crucible pot, 5 $\frac{3}{8}$ inches; height of furnace over all, 6 $\frac{1}{2}$ inches; inside dimensions of crucible space: diameter, 2 $\frac{5}{8}$ inches; depth, 2 $\frac{1}{2}$ inches; capacity of crucible, 10 ounces gold. Complete with one No. 00 clay crucible, but without blower. \$6.75
6322. **FURNACES, Crucible, Fletcher's Perfected Injector**. Can be used on coal, gasoline or natural gas. Burner is in one casting, preventing nozzle from becoming overheated. Complete with one crucible, but without foot blower.
- | | | |
|--|-----------------|-----------------|
| No. | 41 | 41A |
| For crucible, No. | 1 | 3 |
| Diameter of crucible space inside, inches | 3 $\frac{1}{2}$ | 4 $\frac{3}{4}$ |
| Height of crucible space, inches | 3 $\frac{1}{2}$ | 5 $\frac{1}{2}$ |
| Foot blower required to furnish blast, No. | 9A | 9B |
| Each | 10.50 | 13.00 |
6323. **Extra Clay Crucibles for No. 6322**.
- | | | |
|-----------|-----|------|
| No. | 1 | 3 |
| Per dozen | .90 | 1.50 |
6328. **FURNACE, Fletcher's Crucible and Muffle Combined**, for use with coal, gasoline or natural gas, from $\frac{1}{2}$ or preferably $\frac{3}{4}$ inch supply. Requires No. 9B Foot Blower to produce blast. Will take No. 3 crucible or No. 6 when cover is reversed, or a muffle 3 $\frac{1}{2}$ x2 $\frac{7}{8}$ x6 $\frac{1}{4}$ inches. Height of furnace, 11 inches; outside diameter, 9 $\frac{1}{2}$ inches; diameter of crucible space, 6 inches; height of crucible space, 6 $\frac{1}{2}$ inches; maximum gas consumption, 100 cubic feet per hour. Complete with injector burner, No. 3 clay crucible, and muffle 25.00



No. 6342.



No. 6350.

FURNACES, MUFFLE, ELECTRICALLY HEATED

FURNACES, Muffle, Hoskins Electric, Type FD, with heating element of Chromel wire wound in spiral grooves on a special refractory muffle, surrounded by packing material with high heat insulating qualities. Heating elements can be easily rewound by user in case of burn-out, as the wire is furnished in spiral coils of the proper length ready to wind in the grooves of the muffle. The entire renewal requires but a few minutes. **A rheostat should be used to keep the temperature within safe working limits.** This furnace is useful for ash determinations, ignition of precipitates, incinerations, fusions, combustions, enameling, hardening and annealing small pieces of steel, melting alloys and metals, etc. **Without rheostat.**

	No.	201	202	203	204
	Inside dimensions of muffle space, inches.	3 1/8 x 2 1/2 x 7	4 1/4 x 3 x 8	5 1/4 x 3 3/4 x 12	7 1/2 x 5 1/4 x 14
	Maximum consumption, watts.....	850	1300	2100	3400
6342.	Furnace only	\$60.00	75.00	100.00	130.00
6343.	Furnace and rheostat.....	72.50	89.50	122.00	168.00
6344.	Muffle only without wire.....	9.00	13.50	19.00	27.00
6345.	Chromel wire for rewinding.....	4.25	7.50	12.00	17.50

In ordering, kindly specify voltage.

6346.	Rheostats for No. 6342, for controlling temperature.				
	For furnace, No.....	201	202	203	204
	Each	12.50	14.50	22.00	38.00

In ordering, kindly specify voltage.

FURNACES, Muffle, Hoskins Electric, Type FB, for temperatures up to 1100°C. These furnaces are designed for heavy continuous duty, and are intended to operate on low voltages. They are therefore best adapted to operate on alternating current in connection with a transformer. **Temperature control within safe working limits must be secured by means of a rheostat in the case of No. 202 Furnace and by means of a regulating transformer in the case of No. 204.** These furnaces are made for 110, 220 and 440 volts on either 60 or 25 cycles. Prices will be quoted upon request in the case of other voltages or frequencies.

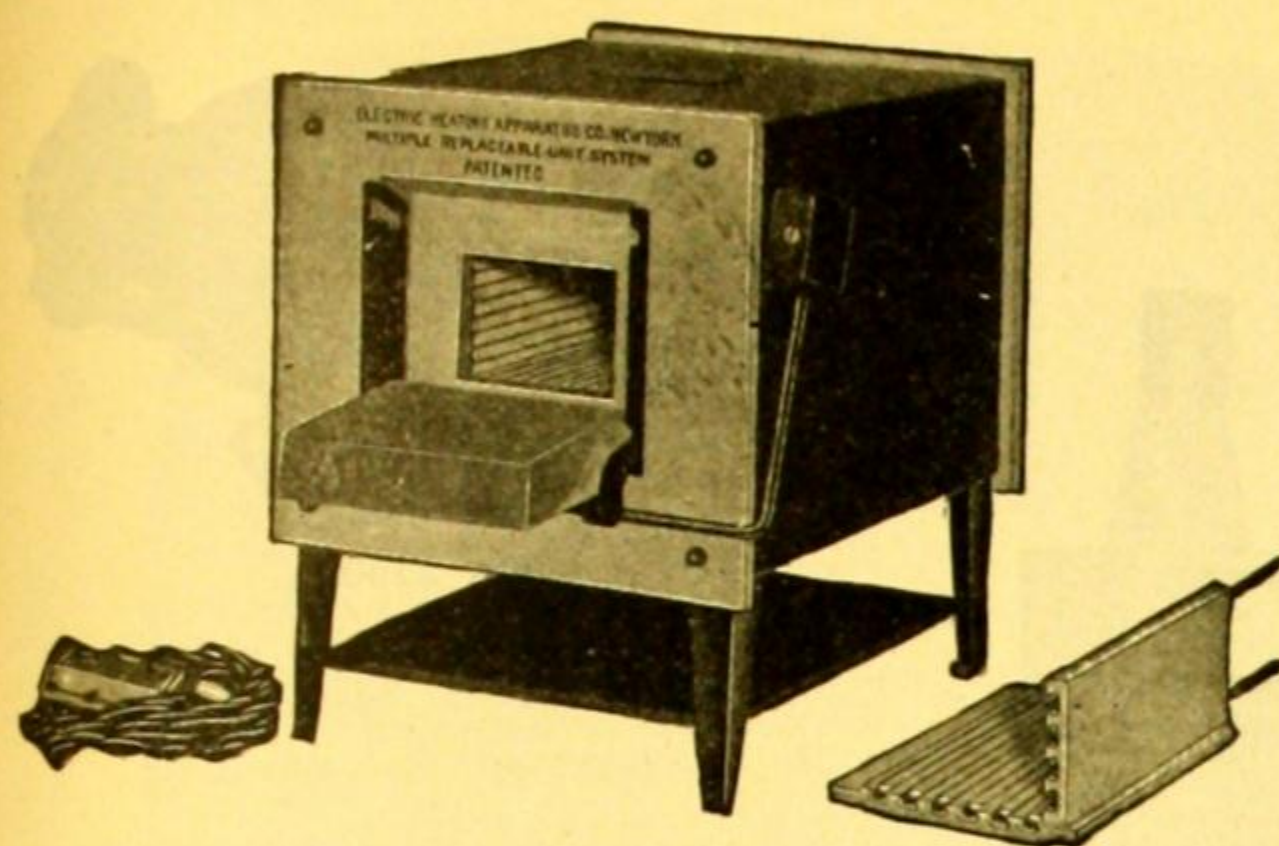
	No.	202	204
	Inside dimensions of muffle space, inches.....	4 1/4 x 3 x 9	7 3/8 x 5 x 12 1/2
	Maximum power consumed, watts.....	2750	6000
	Time required to raise temperature to 1100°C., minutes.....	90	90
6350.	Furnace only	95.00	130.00
6351.	Furnace with rheostat and transformer, 60 cycles.....	187.00	290.00

In ordering, kindly specify voltage.

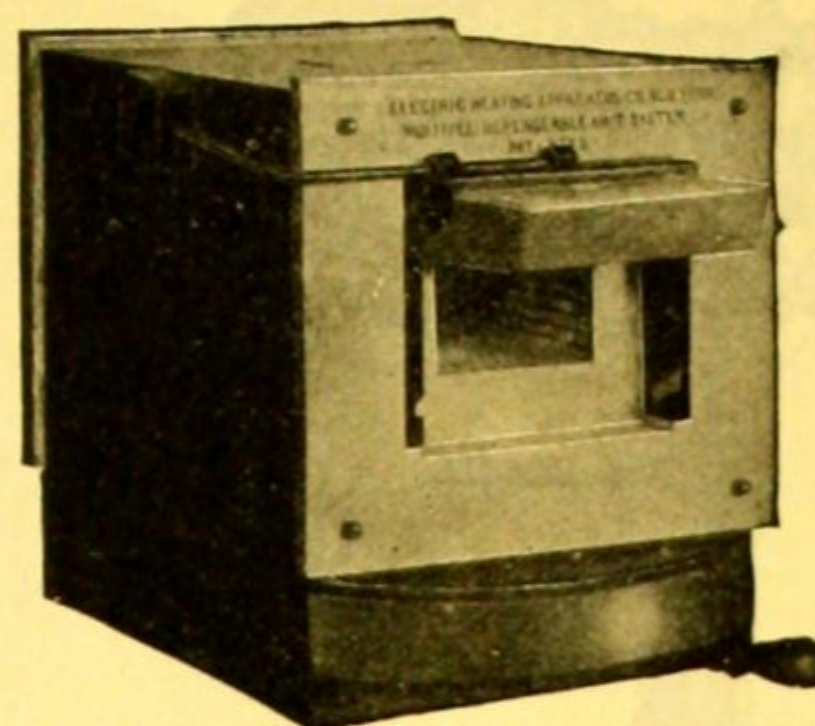
6355.	Extra Heating Elements, Hair Pin Type.		
	For furnace, No.....	202	204
	Number of elements required.....	10	10
	Each	1.30	3.00

In ordering, kindly specify voltage.

Note:—Furnaces of type FB with larger muffle space than those listed can be furnished on short notice, but are not carried regularly in stock. Prices quoted upon application.



No. 6362.



No. 6372.

FURNACES, Muffle, Multiple Unit Electric, for temperatures up to 955°C., for ignition of precipitates, ash determinations, fusions, heat treatment of steel, melting of alloys and metals, enameling, etc. These furnaces are of the multiple unit type, the heating element being made in four sections forming the sides of the muffle chamber. Either of these sections may be replaced independently of the others in case of a burn-out, and all may be reversed, if desired to change from open groove to closed face, the change increasing the time of heating only 3 per cent. on account of the high conductivity of the material. The superior heat insulation of the Multiple Unit Furnaces permits a larger muffle space for the same power consumption. These furnaces can be operated interchangeably on 110 and 220 volts by means of a selective plug furnished with the equipment. A rheostat should be used to keep the temperature within safe working limits. The counter-weighted doors are reversible for hinging at either top or bottom of opening, and are provided with $\frac{3}{4}$ inch air tight mica peephole. A $\frac{7}{8}$ inch pyrometer opening is provided in rear head. A rear door of the plug type with vent hole and handle can be supplied if desired, at additional charge. Complete with six feet of flexible leads and selective plug, and with metal shelf for holding crucibles, tongs, etc.

	No.	50	52	54			
	Inside dimensions of muffle space, inches.	3¼x2½x7	4¼x3x10	5¼x3¾x12			
	Outside dimensions of furnace, inches...	12¼x10¼x14	15x12¼x16	17x13¾x18			
	Shipping weight, furnace only, lbs.....	65	100	135			
	Shipping weight with rheostat, lbs.....	72	107	148			
	Rating of current for 110 volts, amperes.	9.1	13.1	18.8			
	Rating of current for 220 volts, amperes.	4.55	6.55	9.4			
	Maximum power consumption, watts....	1000	1440	2070			
	Kilo watt hours consumed in reaching 1400°F. (760°C.) from 75°C.....	.5	.72	1.2			
	Kilo watt hours consumed in holding 1400°F. (760°C.)	.39	.89	1.37			
6362.	Furnace only	\$65.00	82.50	110.00			
6364.	Extra units for top or bottom, each	4.00	5.50	8.00			
6365.	Extra units for side, each	2.75	3.50	5.50			
6363.	FURNACE, same as No. 6362, but with rheostat No. 6371.						
	No.	50A	50B	52C	52D	54E	54F
	With rheostat No. 6371.....	A	B	C	D	E	F
	For volts	110	220	110	220	110	220
	Each	77.00	77.00	95.50	95.50	128.00	128.00
6371.	Rheostat only of No. 6362 Furnace.						
	No.	A	B	C	D	E	F
	For furnace No.....	50	50	52	52	54	54
	For volts	110	220	110	220	110	220
	Each	12.00	12.00	13.00	13.00	18.00	18.00
6372.	FURNACES, Muffle, Multiple Unit Electric, same as No. 6363, but with rheostat encased in housing below furnace body, convenient for use. This position also eliminates unsightly and dangerous wiring. Complete with six feet of flexible leads and plug.						
	No.	60	62	64			
	Inside dimensions of muffle space, inches.	3¼x2½x7	4¼x3x10	5¼x3¾x12			
	Outside dimensions of furnace, inches...	13x10¼x13	14½x12½x16½	16½x13¾x19			
	Shipping weight, lbs.....	70	105	135			
	Each	82.50	100.00	135.00			

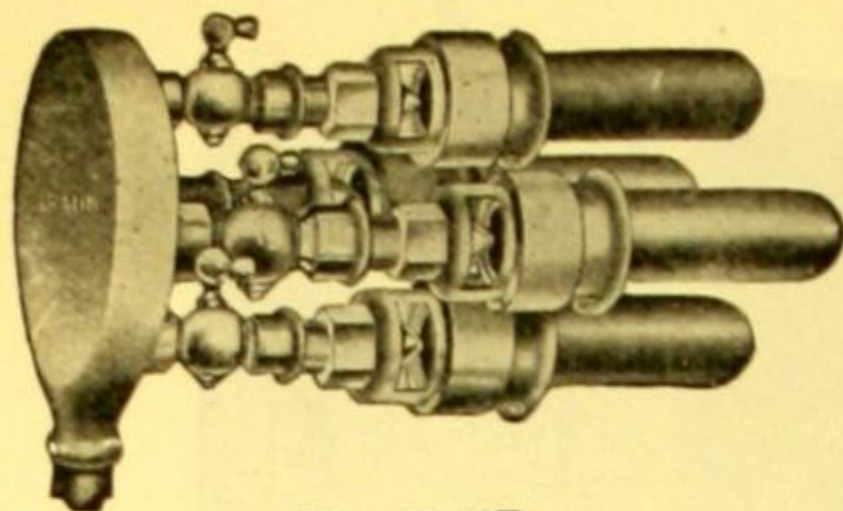
In ordering, kindly state voltage.

For **EXTRA UNITS AND PARTS** for No. 6372, see Nos. 6364 and 6365.

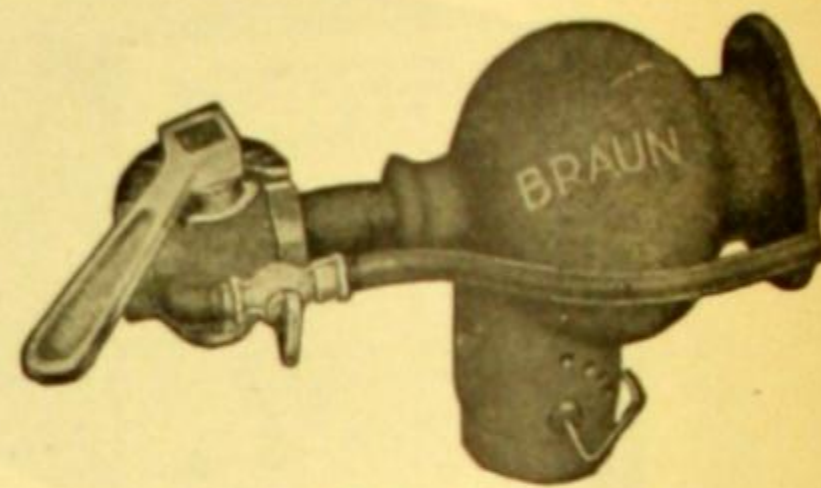
Note:—The use of a Pyrometer with the above furnaces is desirable, as it will enable the operator to know at all times the exact temperature within the furnace chamber. For description, see general heading **Pyrometers**.

2100°F
32
2068°
10340
1150°C.

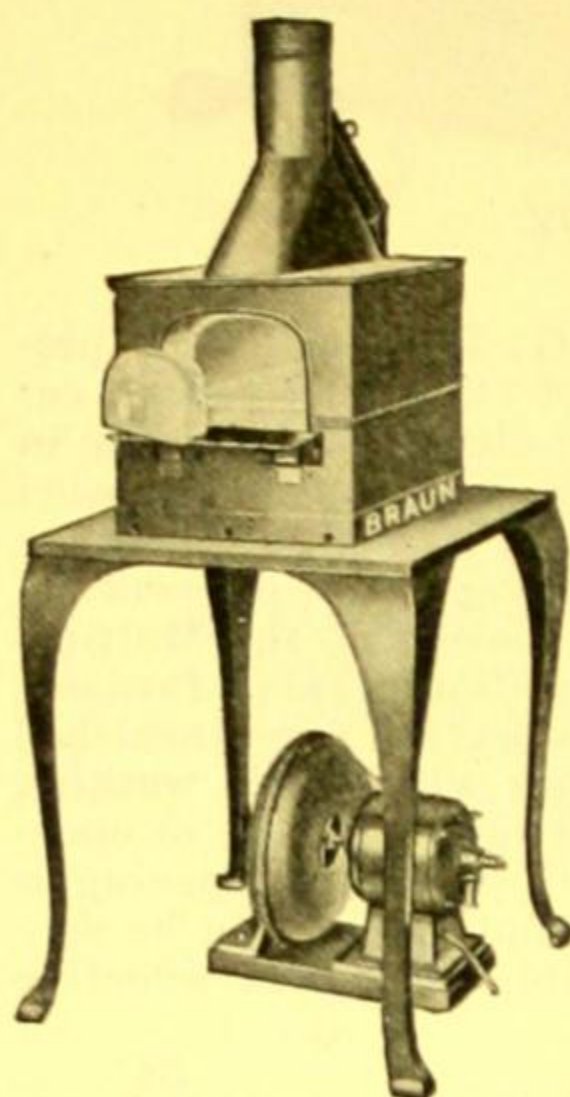
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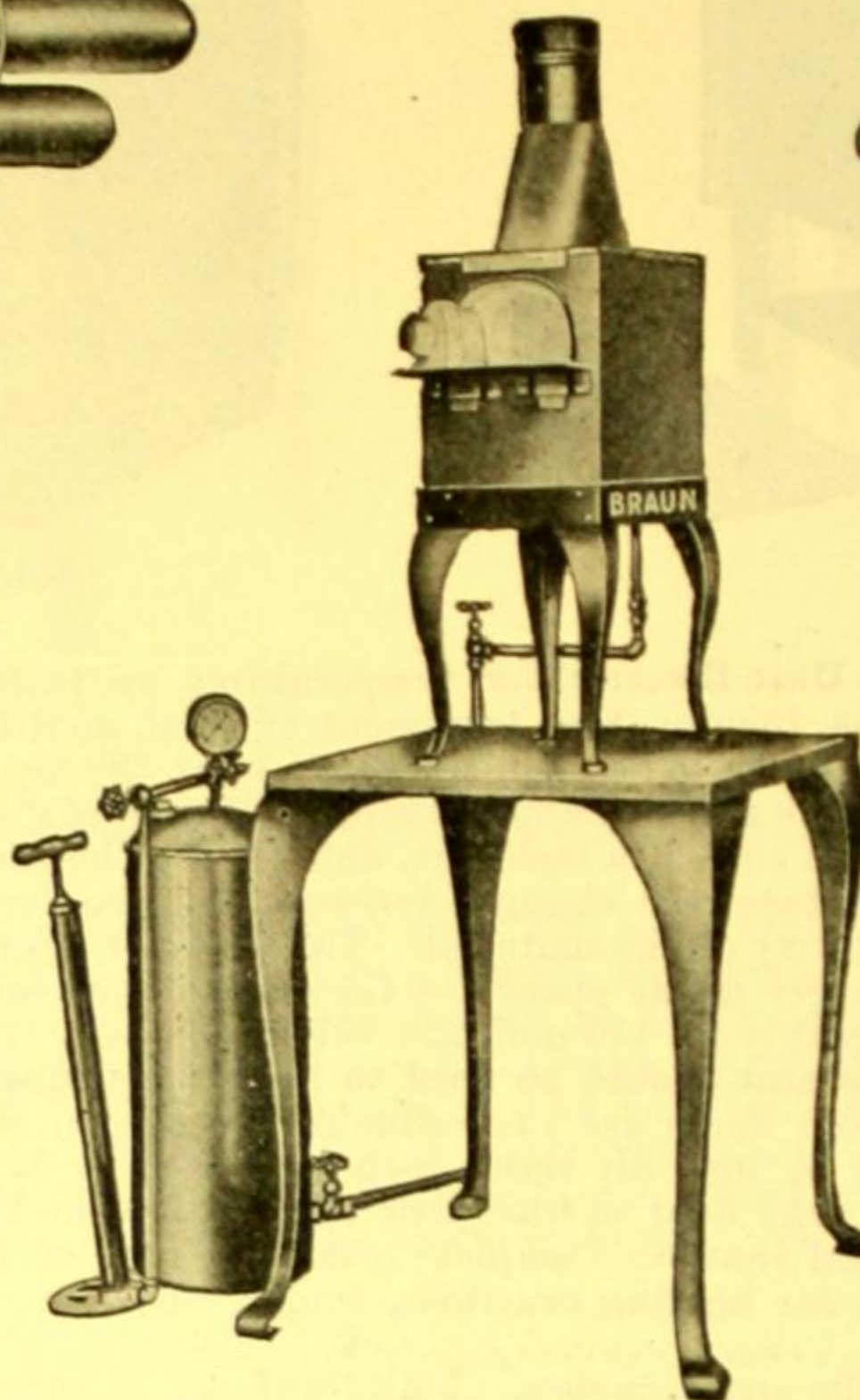
No. 2146D.



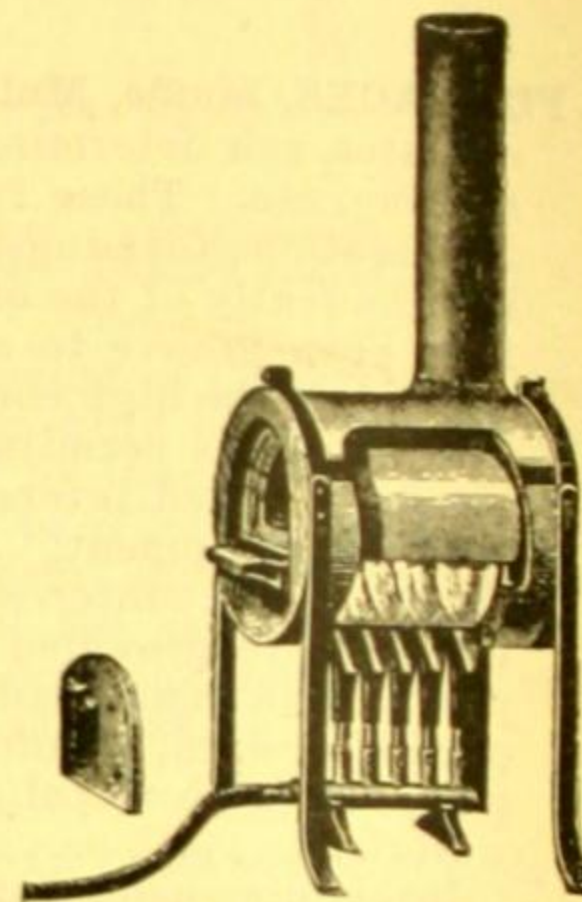
No. 2150.



No. 6398 (shown with complete outfit for burning gas).



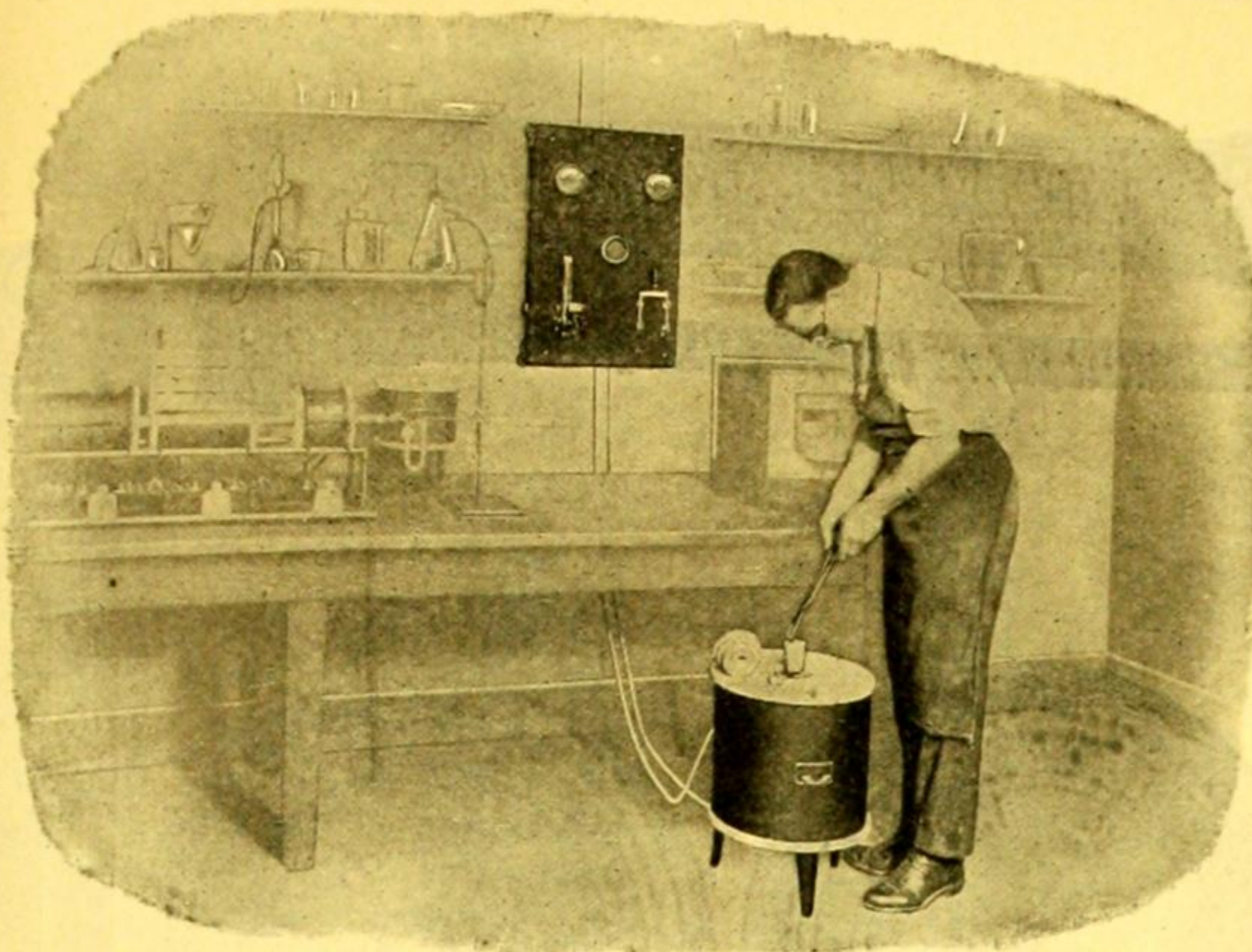
No. 6390. (Shown with complete outfit for use with gasoline.)



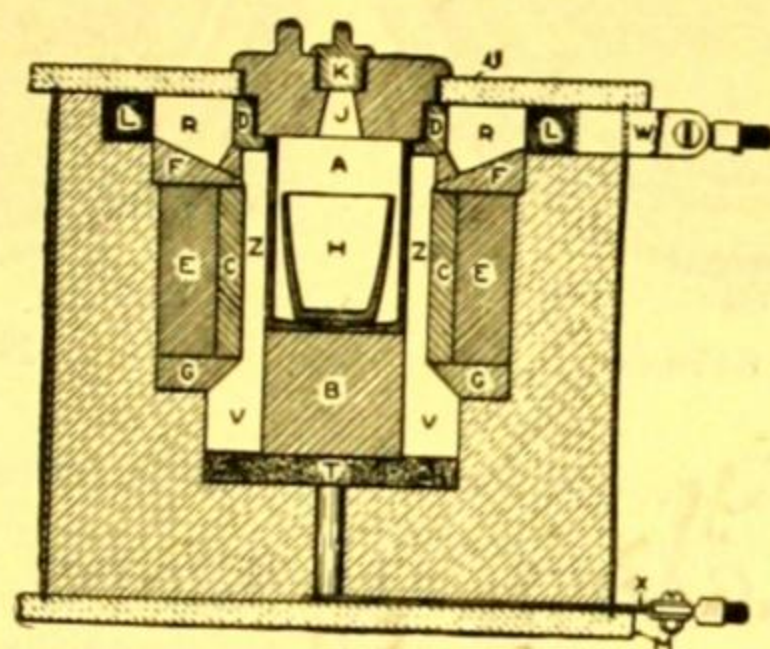
No. 6410.

FURNACES, MUFFLE, GAS HEATED

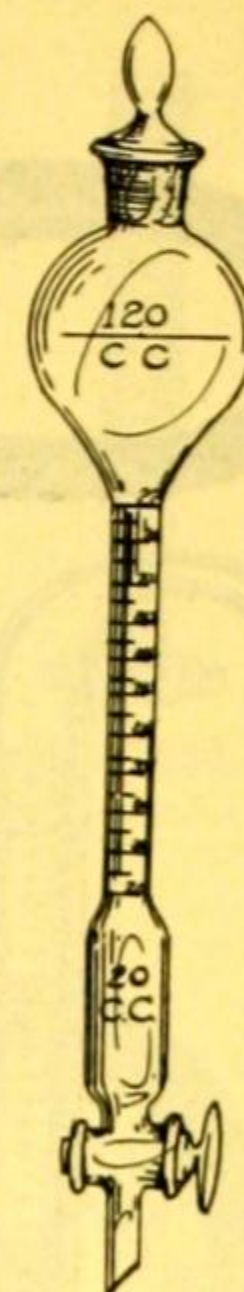
6390. **FURNACE, Muffle, Braun's No. 20**, for operation with gas or gasoline. Mounted on iron legs for convenience in operation. Size of muffle space, 6x12x4 inches. Shipping weight, 140 pounds. Complete with one muffle, hood and two lengths of stove pipe, but **without burner, supporting table, tank or pump**. For gas, Vulcan Non-Blast Burner No. 2146D should be used. \$33.00
6398. **FURNACE, Muffle, Cary's, No. 33**, for gas or gasoline, with patent draft inducing attachment. Furnace is so arranged that special combustion chambers around the muffle distribute the fire and produce a uniform temperature in all portions of the muffle. Size of muffle, 8x12x5 1/4 inches; shipping weight, 250 pounds. Complete with one muffle, muffle door, hood with special draft attachment, and two lengths of stove pipe, but **without burner, supporting table or blower**. Braun Blast Burner No. 2150 is recommended for use with this furnace when burning gas 49.00
2150. **BURNER, Braun's Gas**, for use with Furnace No. 6398, for coal or natural gas. The construction is such as to secure a mixture of gas and air which insures perfect combustion. To secure proper blast a blower must be used. (See Nos. 1402-1410.) Gas should be secured from a 3/4 inch supply pipe. Shipping weight, 18 pounds. Complete with air and gas regulating valves. 16.00
- 2146D. **BURNERS, Braun's Vulcan Non-Blast**, for coal or natural gas, for use with Braun Furnaces. These are non-blast burners operating without noise and upon regular gas pressure. They are so designed as to secure a correct mixture of gas and air to produce the most intense heat. Temperatures up to 2100°F. have been obtained. Each tube consumes about 50 cubic feet of gas per hour. Complete with regulating valve for each of the 4 burners. 16.00
6410. **FURNACE, Muffle, Wiessnegg Type**, for ash determinations, incinerations, etc. Especially recommended for ashing in flour analysis where electric current is not available. Complete with four Meker burners on one base, and with muffle 7x4x3 inches inside. 36.00
6411. **Extra Muffles for No. 6410**. each 1.65



No. 6424. (Shown in use.)



No. 6424. (Shown in section.)



No. 6436.

- 6424. FURNACES, High-Temp Electric**, for temperatures from 500° to 1800°C. This is a low amperage furnace operating on either A. C. or D. C. up to 125 volts, a feature which should commend it to users who are not equipped with transformers or generators for producing low voltage and high amperage currents. The heating element is of the granular resistance type entirely surrounding the cylindrical heating chamber. Outside of the heating element is a concentric cylinder of refractory material surrounded by packing of heat insulating material, making a compact furnace of a high degree of efficiency. All parts are easily replaceable at little expense. With a maximum load of 40 amperes and a maximum power consumption of 2.75 kilowatts, the furnace can be brought to a temperature of 1600° C. in an hour. A switch board is furnished with voltmeter, ammeter, circuit breaker, line switch, and rheostat for controlling the temperature. Diameter of heated chamber, 2¼ inches; depth, 3¾ inches; outside diameter of furnace, 14½ inches; height over all, 19 inches. Dimensions of switch-board panel: 17 inches wide, 26 inches high, and 1 inch thick, requiring 9 inches of space for mounting. Complete with furnace, switchboard, 7 feet of asbestos covered flexible leads, 5 pounds of granular resistor material, and instructions for use, but without crucible.

No.	A	B
For volts	110 A. C.	110 D. C.
Each	\$225.00	210.00

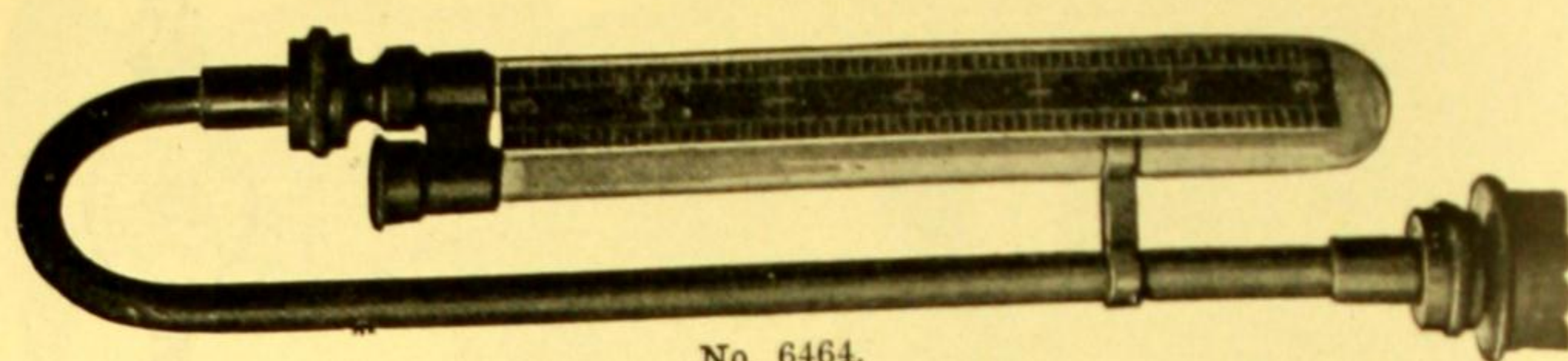
6425. Granular Resistor Material for No. 6424..... per 5 pounds 1.50
 6426. Special Crucibles for No. 6424, capacity 60 cc.....each 1.25

Note:—Price of parts of No. 6424 for replacement furnished on request.

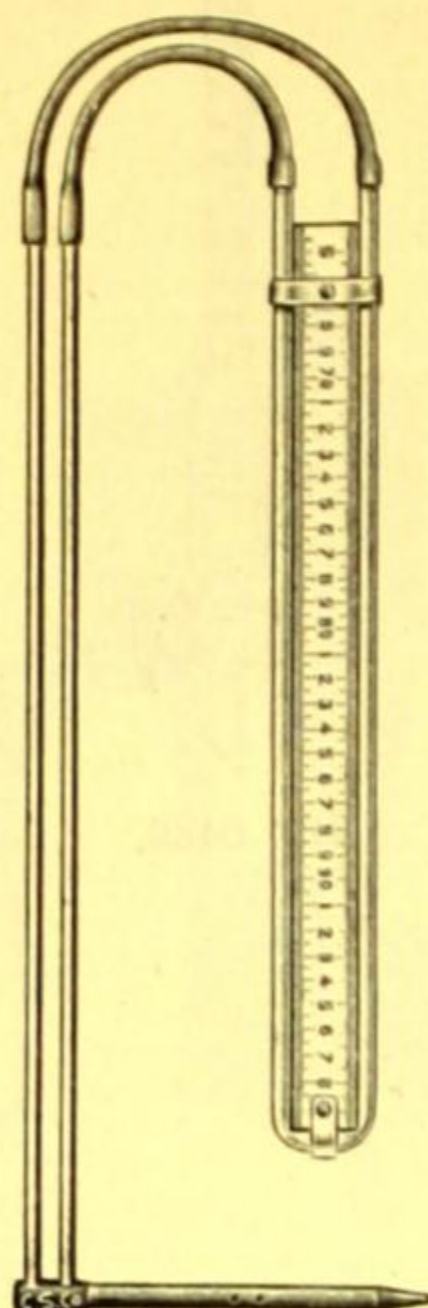
Note:—The use of a Pyrometer with the above furnace is desirable, as it will enable the operator to know at all times the exact temperature within the furnace chamber. For description, see general heading Pyrometers.

For No. 6428 FURNACE, Electric Arc, see page 532.

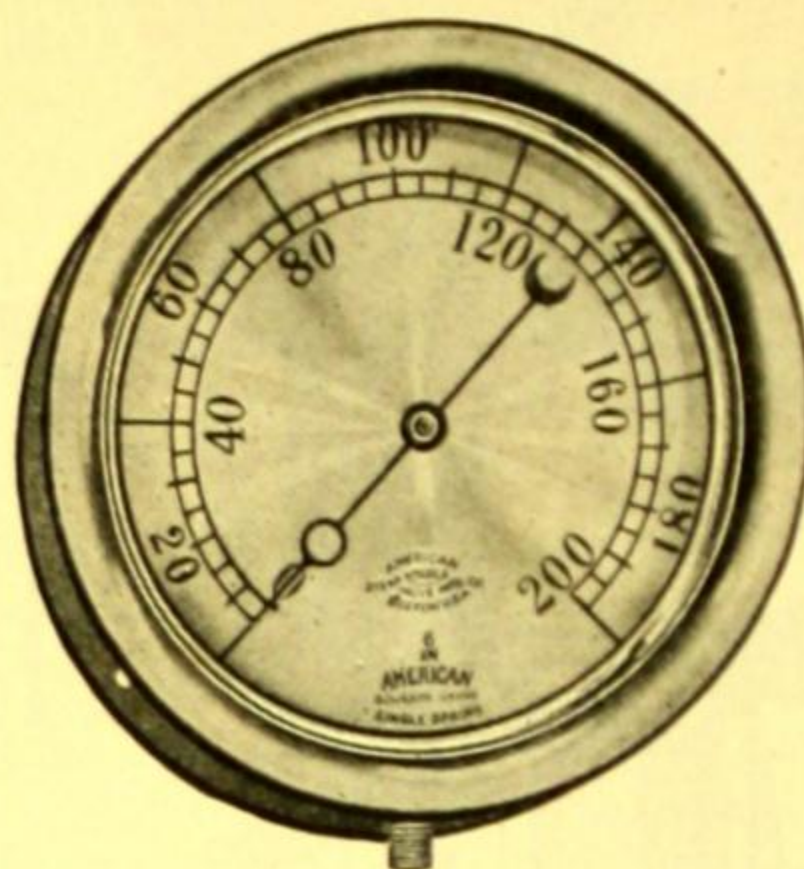
6436. **FUSEL OIL APPARATUS**, Bromwell, with stop-cock and glass stopper ground in, as used by the Association of Official Agricultural Chemists. Capacity of lower bulb, 20 cc, stem graduated from 20 to 22 cc in 1/50th cc divisions. (See Bulletin 107, Bureau of Chemistry, United States Department of Agriculture)..... 4.50



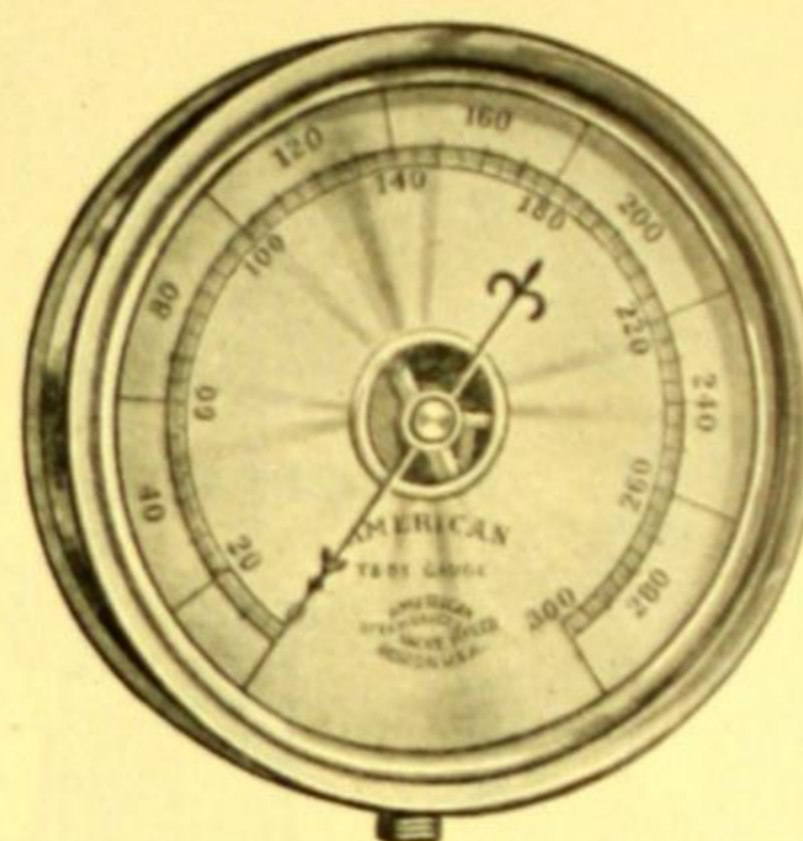
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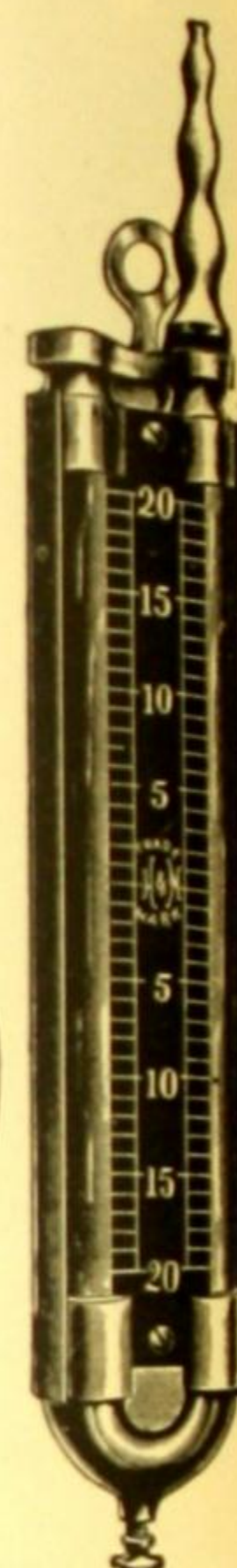
No. 6460.



Nos. 6474-5.



No. 6478.



No. 6466.

GAGES, ALL KINDS

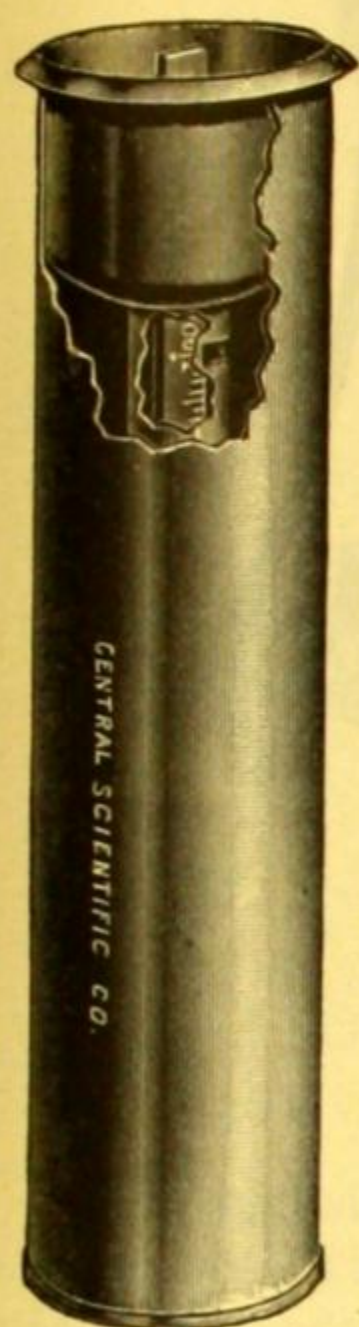
GAGES, Altitude, see Barometers.

6460. **GAGE, Differential (Pitot Tube)**, as described by Pres. P. B. Woodworth of Rose Polytechnic Institute at the 1915 meeting of the C. A. S. & M. T. Outfit includes a brass Pitot tube of correct shape and dimensions, and a glass manometer tube suitably mounted on a scale $\frac{1}{2}$ meter long graduated in both metric and English systems. With this tube accurate measurements of the flow of gases and liquids may be made. It may also be used as a velocity indicator on motor boats and in open streams of water, or in pipes conveying air, water or steam. A set of curves is furnished with the apparatus by means of which pressure values may be converted into velocities in units of feet per second or miles per hour for either air or water. \$12.00
6464. **GAGES, Draft, U-Tube or siphon form**, with metal fittings and removable brass bend and union. Scale graduated in $\frac{1}{10}$ inch divisions.
- | | | | | |
|----------------------|------|------|------|-------|
| Length, inches | 8 | 12 | 18 | 24 |
| Each | 6.00 | 7.00 | 8.00 | 14.75 |
6466. **GAGE, Draft, pocket U-form**, armored for protection, with hose connecting piece and adjusting valve. With 6-inch scale graduated in $\frac{1}{10}$ inch divisions 12.50

GAGES, Heat, see Pyrometers.

GAGES, PRESSURE

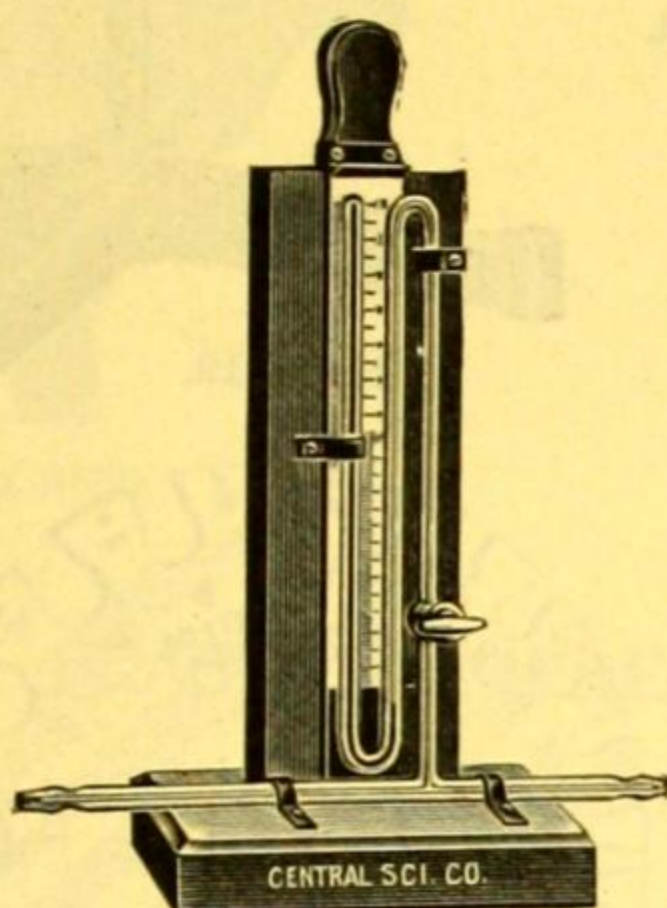
6474. **GAGE, Pressure**, commercial type, improved single spring form, for air, steam or water pressure; iron case with nickel-plated trimming, $3\frac{1}{2}$ -inch dial, range 0 to 30 pounds per square inch. Provided with stopcock, and nipple for attaching hose 5.00
6475. **GAGE, Pressure**. Same as No. 6474, but with range 0 to 100 pounds..... 5.00
6478. **GAGE, Pressure, Standard**, so-called test gage. A gage of extreme accuracy, graduated by means of an open column of mercury and tested under the most severe conditions. Extremely sensitive under all pressures and guaranteed to be absolutely correct when shipped. Range, 0 to 100 lbs., with stopcock, and nipple for attaching hose. Entirely of brass, case nickel-plated. 17.00
- GAGE, Pressure**, for gas cylinders, see Nos. 6530, 6552 and 6553.



Nos. 6480-2.



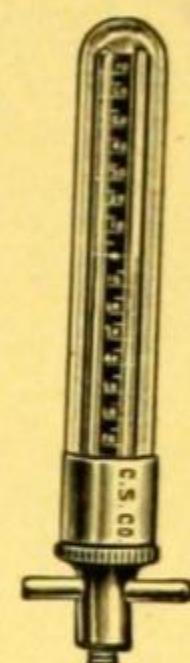
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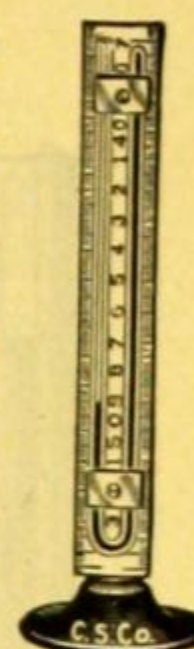
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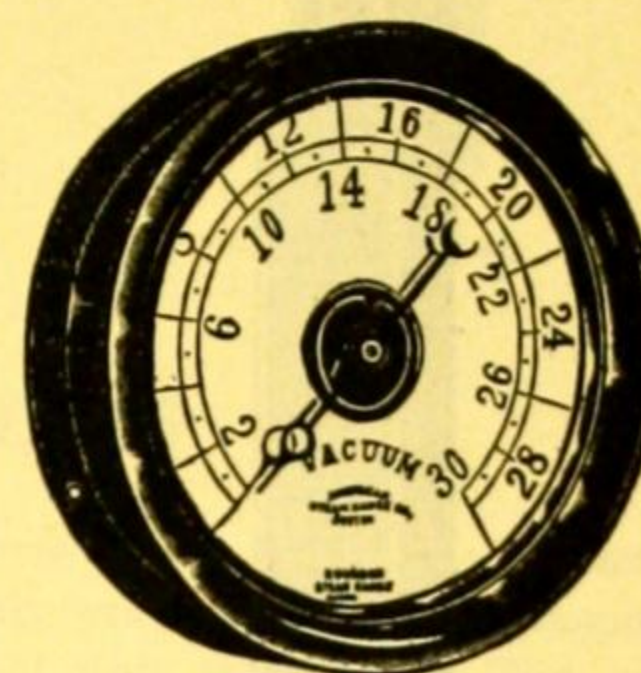
No. 6490.



No. 6494.

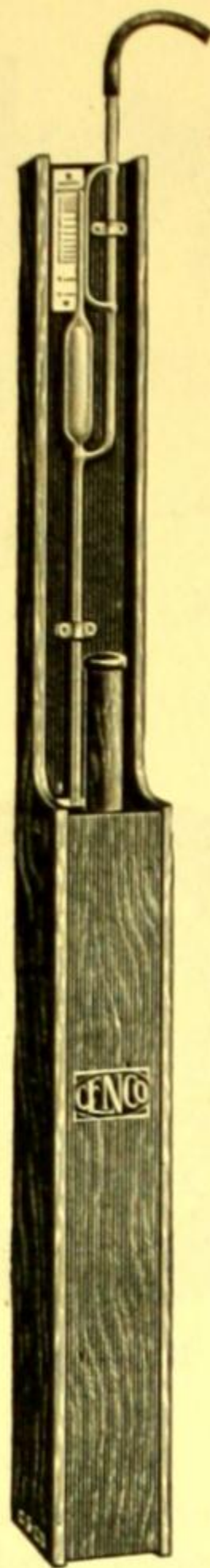


No. 6496.

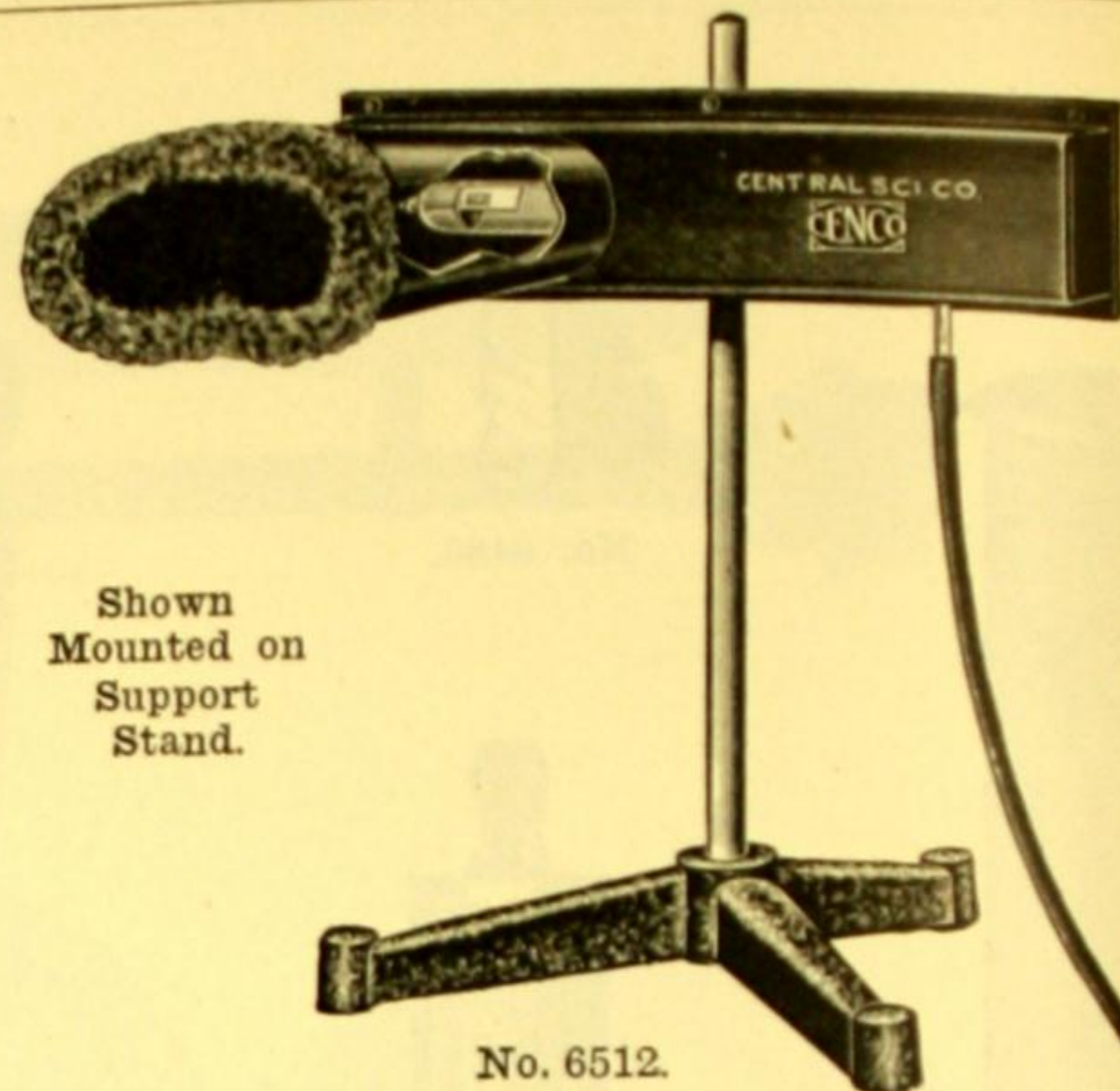


No. 6504.

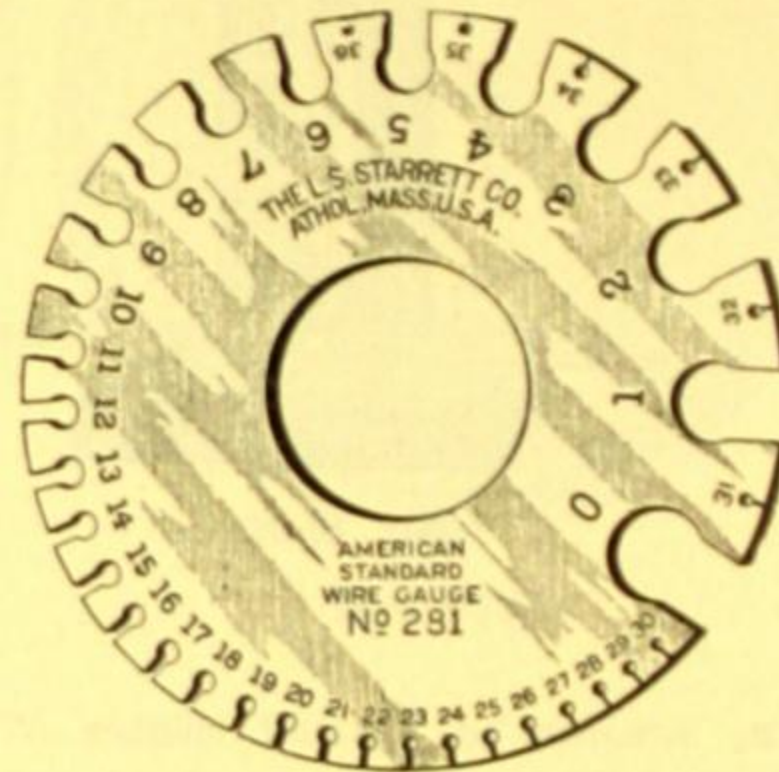
6480. **GAGE, Rain**, similar to United States Weather Bureau type, but smaller. A zinc vessel 3 inches in diameter by 13 inches long, in the top of which is placed a copper cup having an open top exactly 3 inches in diameter with sharp edge and projecting rim. The bottom of this copper cup is open and fits in the top of a brass tube 1 inch in diameter in which the amount of rain is measured. This tube is provided with an overflow opening and a wood rule graduated for reading the rainfall directly to $\frac{1}{100}$ th of an inch..... \$4.00
6482. **GAGE, Rain, United States Weather Bureau Standard**, similar to No. 6480, but 8 inches in diameter and 23 inches long, with inner tube of brass. Complete with measuring stick 12.00
6486. **GAGE, Screw Pitch**, with 24 pitches, 4 to 30 threads to the inch; V thread..... 1.75
6490. **GAGE, Tube**, of steel. For measuring the internal diameters of tubing, etc. Scale range, 1 to 15 mm. Graduated to $\frac{1}{10}$ mm..... 1.60
6494. **GAGE, Vacuum, or Manometer**, for use with air pumps which are provided with a $\frac{7}{16}$ inch opening tapped with 16 threads to the inch. Enclosed in glass tube with oxidized scale 14 cm long, graduated in millimeters. Filled with mercury, ready to attach to pump.. 10.00
6496. **GAGE, Vacuum, or Manometer**. To be used under any bell jar which is 8 inches or more high. Tube is mounted on a base with millimeter scale. Filled with mercury ready for use 2.50
- GAGE, Vacuum, or Manometer, of glass**, with stop-cock and movable mirror scale graduated in millimeters for 13 cm above and below the zero line. Mounted on a wood support.
6499. Without mercury 10.00
6500. Filled, ready for use..... 15.00
6504. **GAGE, Vacuum**. Same type and description as No. 6474. Range 0 to 30 inches..... 5.00
6506. **GAGE, Combination Pressure and Vacuum**, combining Nos. 6474 and 6504, showing both pressure and vacuum on one dial; 3 $\frac{1}{2}$ -inch dial, in iron case with nickel trimmings..... 8.00



No. 6511.

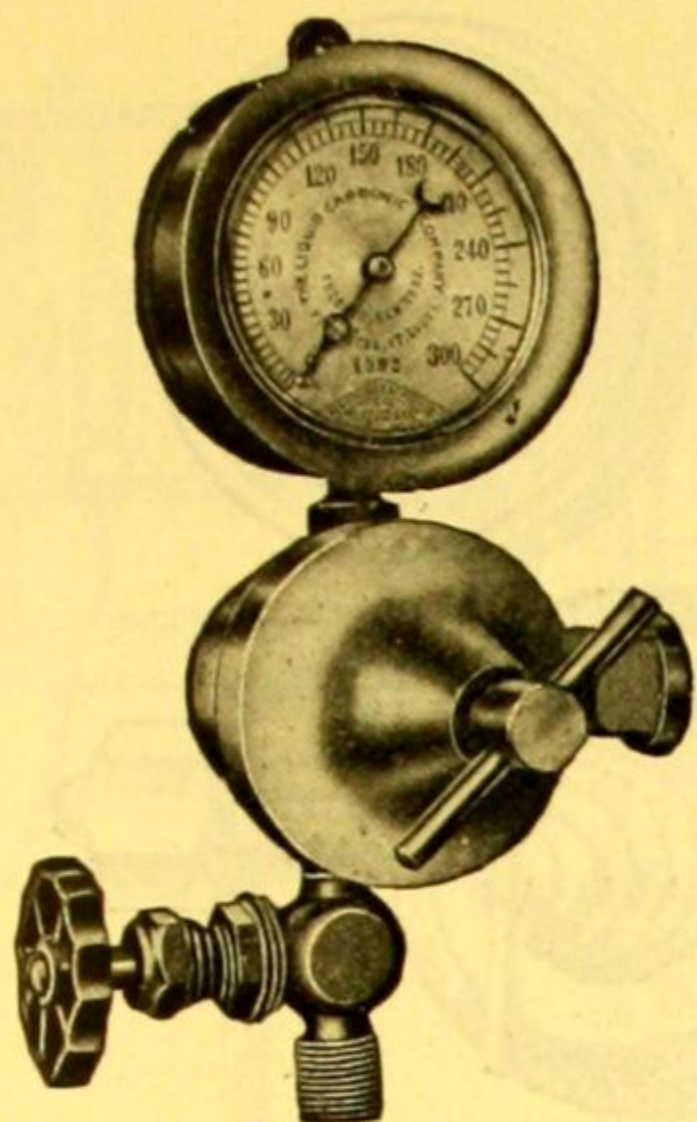
Shown
Mounted on
Support
Stand.

No. 6512.



No. 6514A.

6511. **GAGE, McLeod, Improved Form**, with all glass parts completely protected by the wood frame and with a unique construction of mercury reservoir permitting rapid readings to be made. The upper portion of the gage consists of a cylindrical bulb ending in a fine closed capillary tube, with a hand calibrated scale reading to 0.0005 mm. The mercury reservoir at the bottom is made in the form of a long cylinder in which a wooden plunger fits loosely, the top of which, extending from the cylindrical reservoir, serves as a handle. When the plunger is pushed down, the mercury level is suddenly raised by the displacement, forcing the mercury rapidly into the bulb and capillary. This feature is a great improvement over the usual type of gage, as it reduces materially the time required to take a reading. With this instrument three readings may be made in one minute, thus permitting changes in pressure to be more closely followed than with the usual type of gage. The glass parts are substantially secured to the frame and are so protected by it as to minimize breakage. The instrument is nicely finished, with polished woodwork and nicked fittings. Height over all, about 60 inches; mercury required, 7 pounds. **Without mercury..... \$52.00**
6512. **GAGE, Vacuum, Cenco**, for the measurement of vacua within the range of 0.50 to 0.05 mm. The gage consists of a vacuum tube with aluminum disk electrodes, enclosed in a metal housing with interior painted dead black. When the terminals of this tube are connected to an induction coil capable of furnishing a $\frac{1}{2}$ inch spark and the tube outlet is connected by pressure tubing to a vacuum pump or to the vessel being exhausted, the usual phenomena of discharge through rarified gases will be observed in the tube as the vacuum increases. When the vacuum reaches about 1 mm, a dark space (Crooke's) will be observed immediately in front of the negative electrode. As the vacuum continues to increase, the width of the dark space increases accordingly. From the scale attached to the tube, which has been carefully calibrated by means of a McLeod gage, the degree of vacuum in hundredths of a millimeter can be read directly. An eye-shade is attached to the front of the box for convenience in observation. **Without support stand..... 20.00**
- GAGES, Wind, see Anemometers.**
6514. **GAGES, Wire, American standard, of best tempered steel.**
- | | | |
|-------------|---------|---------|
| No. | A | B |
| Sizes | 0 to 36 | 5 to 36 |
| Each | 3.00 | 2.50 |
- GALVANOMETERS, see Electrical Instruments.**



No. 6530.



No. 6541.



No. 6545.

GASES COMPRESSED IN CYLINDERS

We furnish cylinders tested in accordance with the latest regulations of the Interstate Commerce Commission. These cylinders are returnable for credit and refilling only when all return transportation charges are prepaid and only when they have not been used to hold any other gas. The serial number of the cylinder must be shown on the Bill of Lading and the green labels attached to cylinder must be **destroyed** before such cylinders are offered **empty** to the transportation company for return to us. Many of the gases formerly listed by us are ordered so infrequently that we no longer stock them but refer our customers direct to the manufacturers whose names are given below.

6527. **GAS, Carbon Dioxide (Carbonic Acid)**, liquefied, in cylinders containing 20 lbs., suitable for use in freezing microtomes and for other laboratory purposes. Dimensions of cylinder, 6x54 inches \$23.00

Note:—Cylinder returnable for credit at \$15.00 less rental charge of 1 cent per day after 60 days.

6530. **REGULATOR, Constant Pressure**, for carbon dioxide tanks, for delivering carbon dioxide at any desired pressure from 5 to 300 pounds. Complete with regulator and gage reading to 300 pounds in 5-pound divisions..... 15.75

6534. **GAS, Hydrogen**, 99.5% pure, in 100 cu. ft. cylinders under pressure of 1800 pounds per square inch, especially adapted for hydrogen ion concentrations and electrometric titrations. Dimensions of cylinder, 7¼x38 inches..... 35.00

Note:—Cylinder returnable for credit at \$30.00 less rental charge of 25 cents per week after 30 days.

6535. **GAS, Hydrogen**, same as No. 6534 but in 200 cu. ft. cylinders, 9x51 inches..... 60.00

Note:—Cylinder returnable for credit at \$50.00 less rental charge of 50 cents per week after 30 days.

6533. **GAS, Nitrous Oxide ("laughing gas")**, liquefied, 100 gallons of gas compressed into a steel cylinder measuring approximately 3½x14 inches. Suitable for hospital and dental uses.. 13.50

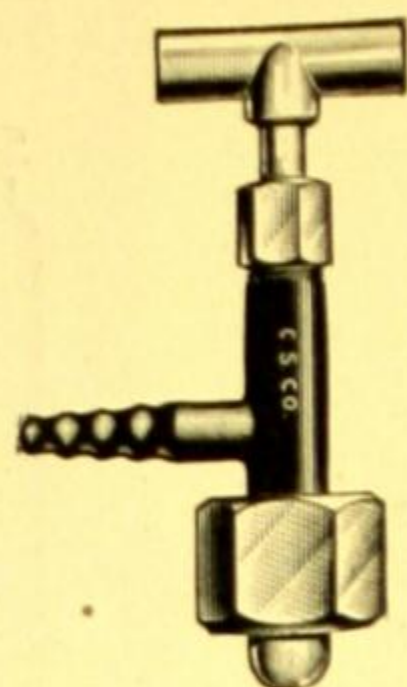
Note:—Cylinder returnable for credit (no rental charge) at \$9.00.

6539. **GAS, Oxygen**, 99% pure in 100 cu. ft. cylinders under pressure of 1800 pounds per square inch, as used in calorimetry, steel analysis, carbon combustions, etc. Dimensions of cylinder, 7¼x38 inches 35.00

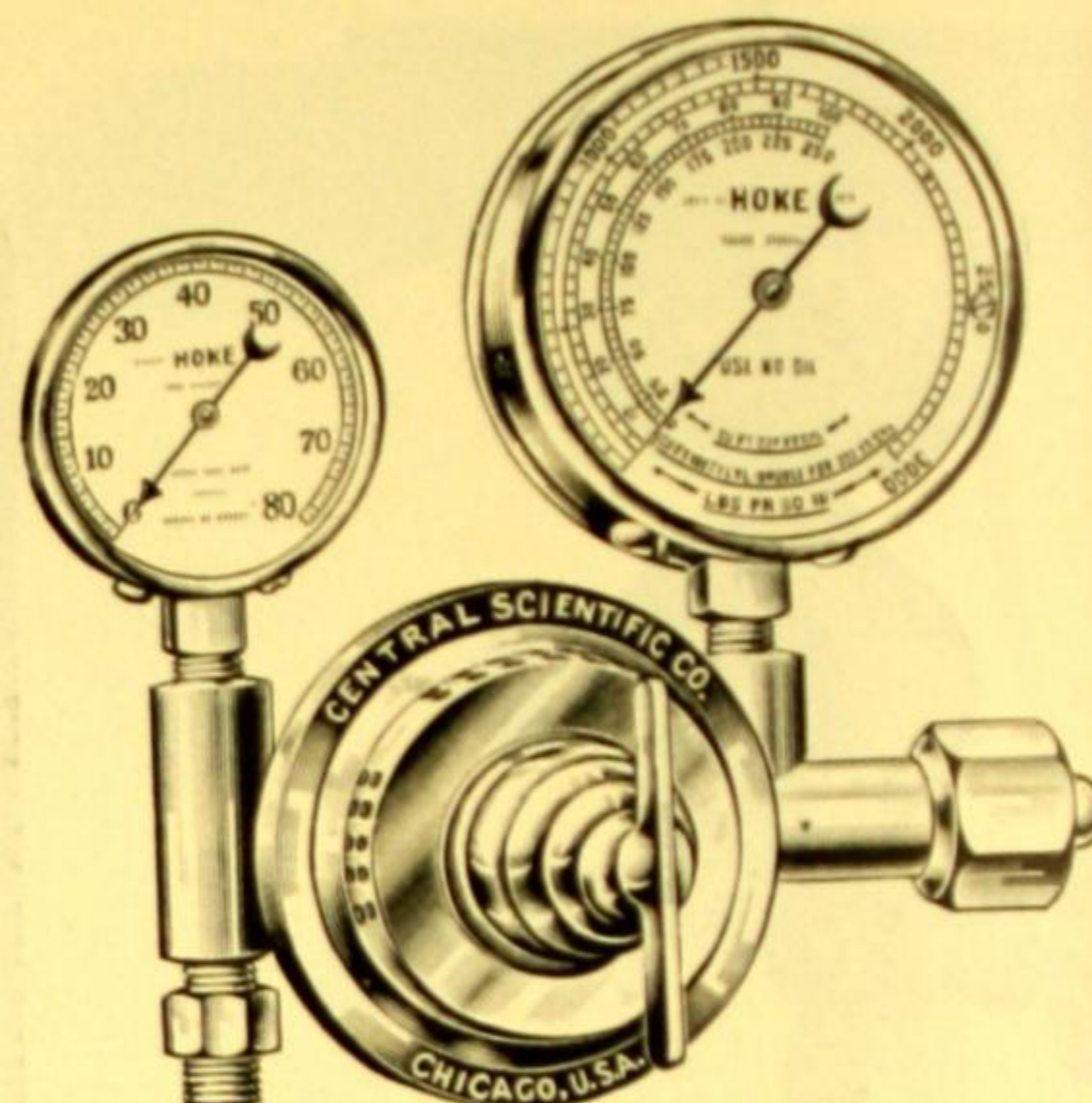
Note:—Cylinder returnable for credit at \$30.00 less rental charge of 25 cents per week after 30 days.

6541. **GAS, Oxygen**, same as No. 6539 but in 200 cu. ft. cylinders, 9x51 inches..... 60.00

Note:—Cylinder returnable for credit at \$50.00 less rental charge of 50 cents per week after 30 days.



No. 6549.



No. 6552.

6545. **GAS, Oxygen**, 99.5% pure, compressed into steel cylinders, as used in hospitals. Needle Valve No. 6549 and Regulators No. 6552-6553 cannot be used with these cylinders but the gas can easily be withdrawn as desired by using Wheel Valve and Yoke No. 6548.

No.	A	B
Capacity, gallons of gas.....	40	130
Approximate size of cylinder, inches.....	3 1/2 x 14	4 1/2 x 24
Each (including cylinder).....	\$12.00	18.50
Cylinders returnable for credit (no rental charge), at.....	9.00	13.50

6548. **WHEEL VALVE AND YOKE** for use with Nos. 6538 and 6545 cylinders. The wheel acts as the wrench and the yoke permits attachment of rubber tubing..... 2.00

6549. **NEEDLE VALVE** for standard oxygen and hydrogen cylinders. This valve will draw gases at an even, moderate speed and is especially valuable for combustion work. By its use it is possible to count bubbles passing through absorption train or washing solution..... 5.00

Note:—The kind and make of gas cylinder must be specified in ordering.

6552. **REGULATOR, Constant Pressure, Hoke-Phoenix**, designed especially for use on high pressure cylinders of oxygen or hydrogen. These regulators are fitted with every device that can add to the safety of the user. The safety inlet coupling prevents a sudden rush of the entire pressure into the regulator. The large gage opens and allows the oxygen to escape in case of a rupture, thus preventing an explosion. The safety perforated bonnet will release the oxygen quickly if the diaphragm should be ruptured, thus preventing injury to the user. The large dial indicates how much gas is in the tank, also whether it is full when purchased, whether there is a leak at any time, and when the tank is empty. The small dial shows the delivery pressure, which is controlled by the regulator from 1 to 40 lbs., as desired. Since these regulators deliver at a steady low pressure they are particularly suitable for hydrogen ion determinations and combustion work. Finished in gilt for oxygen cylinders, with directions 33.00

6553. **REGULATOR, Constant Pressure**, same as above but finished in silver for hydrogen cylinders. 33.00

6559. **GAS, Sulphur Dioxide**, in cast iron cylinders holding about 6 pounds of gas, with valve. Dimensions, 4x15 inches..... 7.50

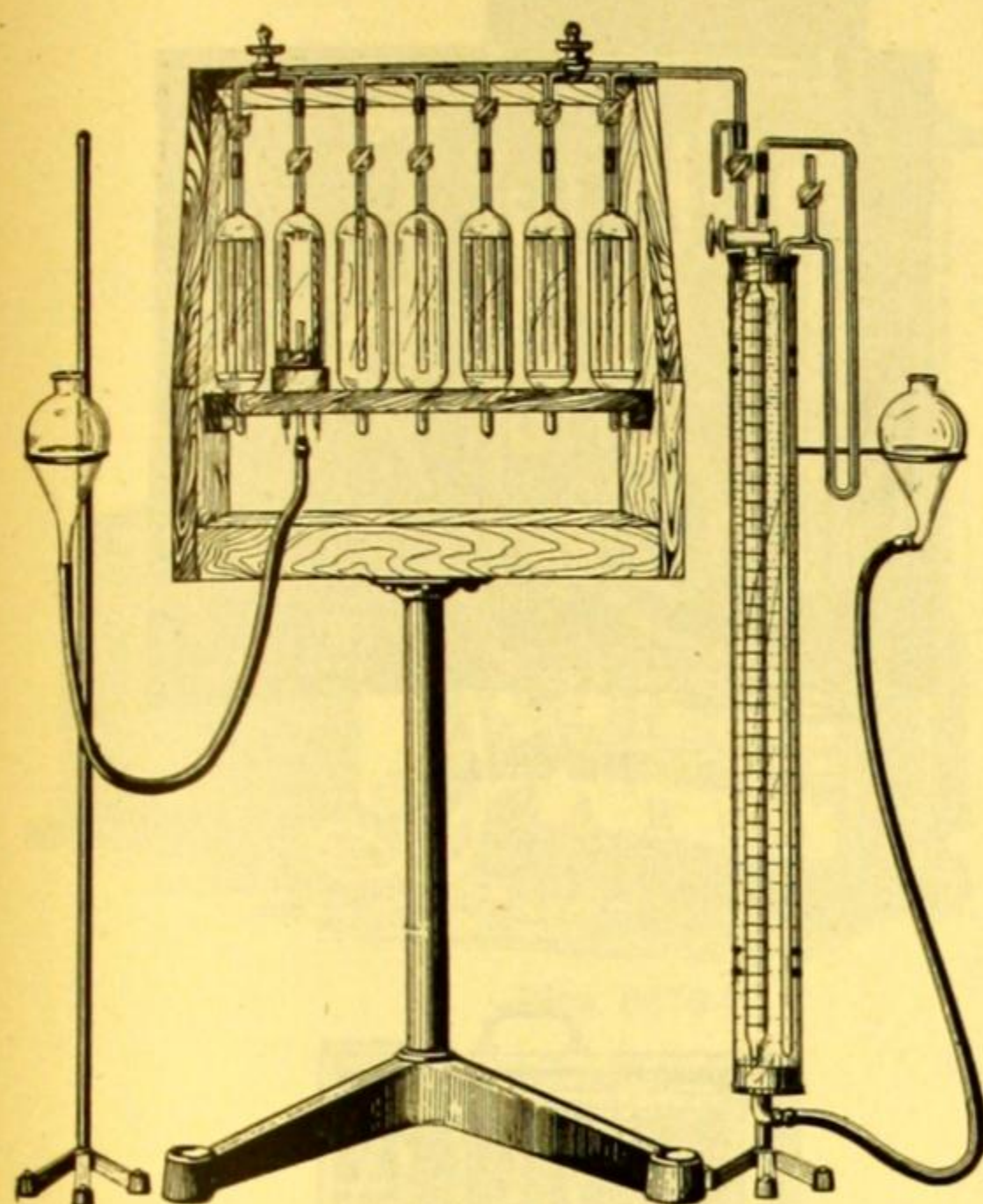
Note:—Cylinders not returnable for credit.

Other Gases

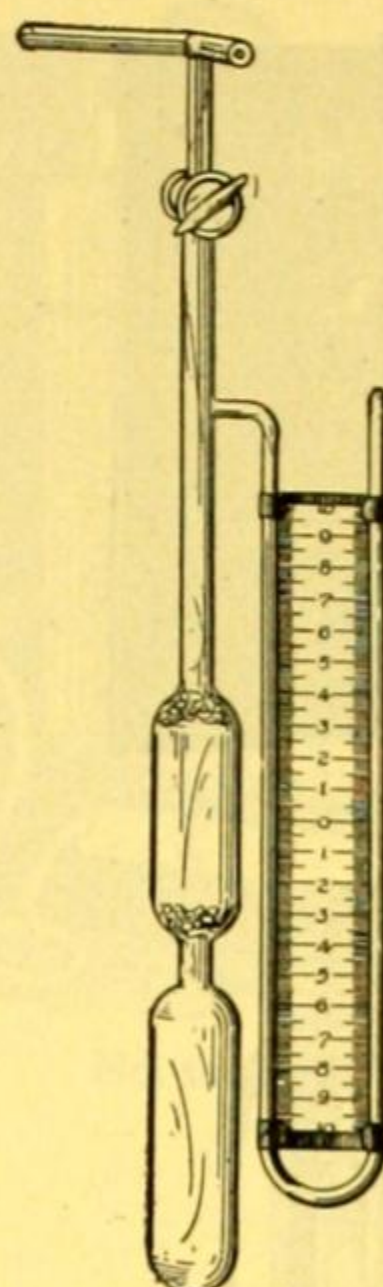
GAS, Ammonia, may be obtained from the Armour Ammonia Works who maintain branches in nearly all large cities. We will furnish name of nearest branch upon application.

GAS, Chlorine, may be obtained from the Electro-Bleaching Gas Co., 18 East 41st Street, New York City.

GAS, Nitrogen, also **Liquid Air**, may be obtained from the Linde Air Products Co. who have many plants scattered over the country but make Liquid Air and its by-product Nitrogen only at Elizabeth, N. J., and Cleveland, Ohio.



No. 6594.



No. 6606.



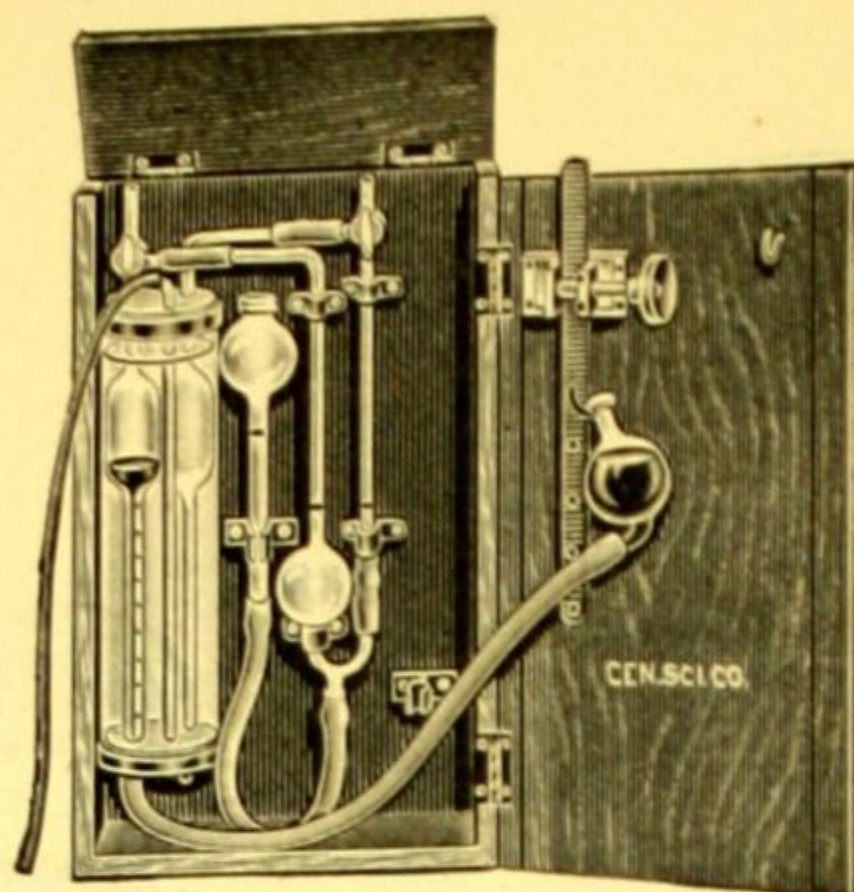
No. 6612.

GAS ANALYSIS APPARATUS

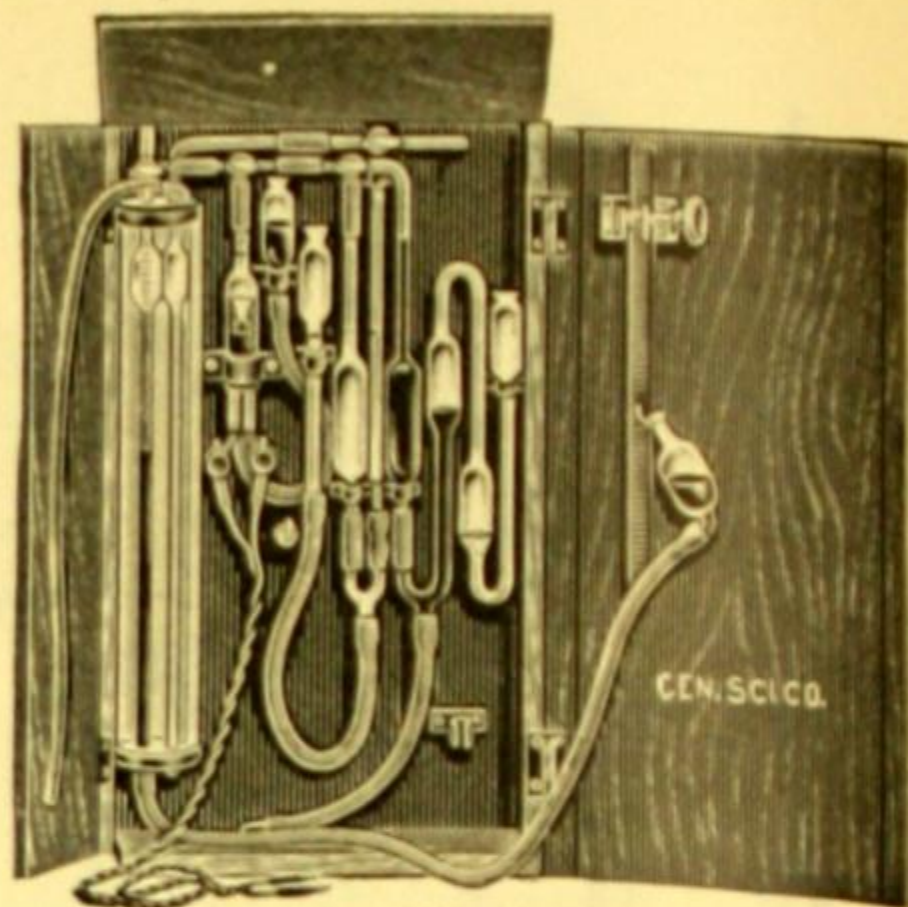
6594. **GAS ANALYSIS APPARATUS**, U. S. Bureau of Mines Form, for Analysis of Gas Mixtures containing CO_2 , C_2H_4 , O_2 , CO , H_2 , CH_4 , C_2H_6 , and N_2 . Recommended for analysis of illuminating gas, oil gas, mine gas, natural gas, flue and furnace gases, exhaust gases from locomotive engines and automobile motors. Mercury is used in the burette and combustion pipette to facilitate precision of measurement. Complete with 7 pipettes including slow-combustion pipette; water jacketed measuring burette, capacity 100 cc, graduated in $\frac{1}{10}$ cc; compensating device; manifold tube with four stop-cocks; and two leveling bulbs; mounted in wooden case with iron supports, **but without mercury**. (See Bulletin No. 42 of the U. S. Bureau of Mines, page 43.) \$110.00

Extra Parts for No. 6594

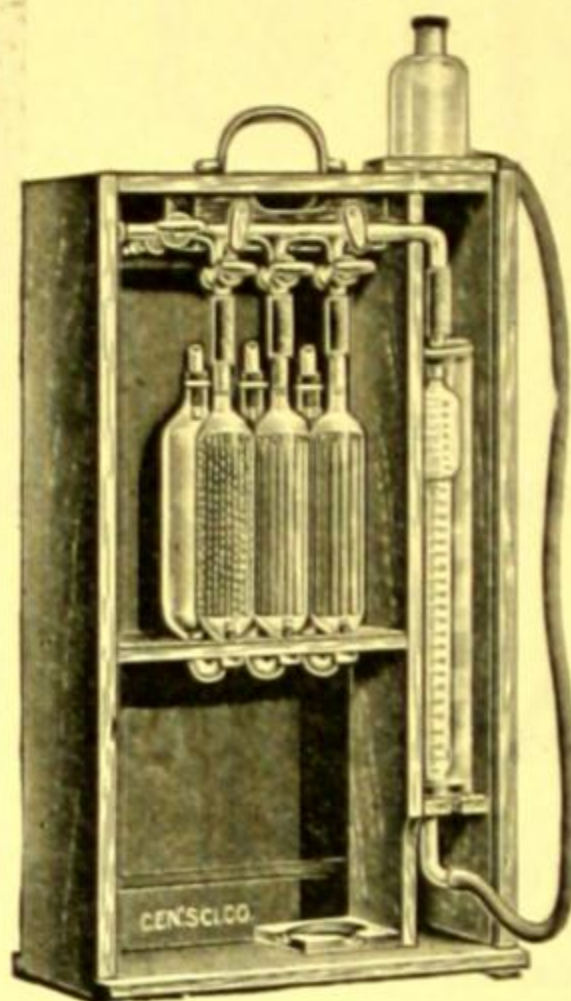
- 6595A. Pipettes, Absorption, with glass tubes.....each 3.00
 6595B. Pipettes, Bubbling, for CO absorption, with stop-cockeach 6.50
 6595C. Pipette, Slow-Combustion, with electrode and stop-cock 5.00
 6595D. Manifold Tube, with four stop-cocks..... 14.00
 6595E. Burette, capacity 100 cc, graduated in $\frac{1}{10}$ cc, with two three-way stop-cocks..... 13.50
 6606. **GAS ANALYSIS APPARATUS**, Burrell's, for determining benzene or gasoline vapor in gas mixtures by the freezing method. (See Journal of Industrial and Engineering Chemistry, Vol. VII, No. 2, for February 1915, page 112; and Technical Paper 87, of the United States Bureau of Mines, page 3)..... 12.00
 6612. **GAS ANALYSIS APPARATUS**, Dwigths' CO_2 Indicator (Patent Applied for), for determining the percentage of carbon dioxide in flue gas and other mixtures. The outfit consists of a cast metal tank with reservoir in the base holding enough solution for 300 tests. The tank is provided with special inlet valve with stop-cock, and an aneroid gage reading directly in percentage of CO_2 , in $\frac{1}{4}$ per cent. divisions. The test is practically instantaneous, requiring only 1 minute to complete. Complete as described with 6 feet of rubber tubing, pressure bulb and sufficient chemical in dry form to make up one charge for the instrument..... 35.00
 6612A. Chemical for renewal of No. 6612 CO_2 indicator, in dry form.....per bottle 1.25
 6613. **Traveling Case** for No. 6612, covered with karatol grain leather, plush lined, with handle and nickel-plated trimmings, and with lock and key 5.00



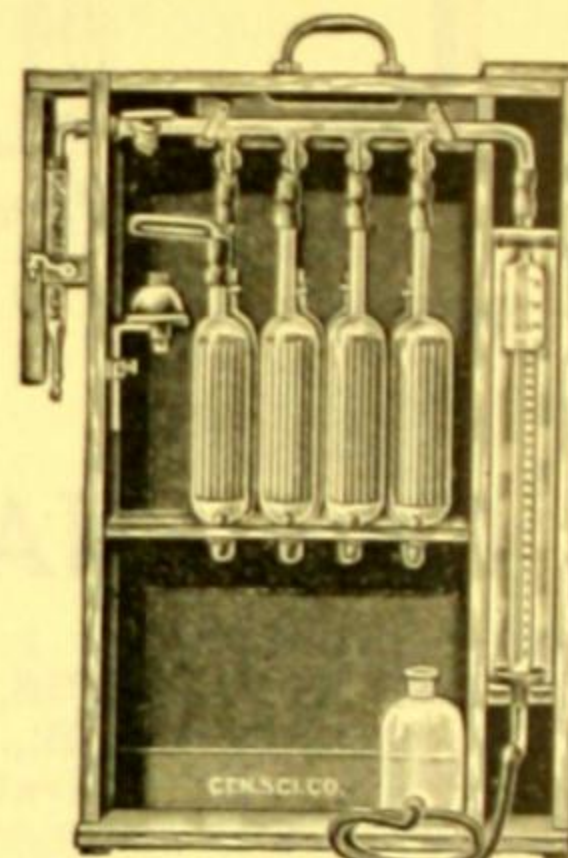
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No. 6624.

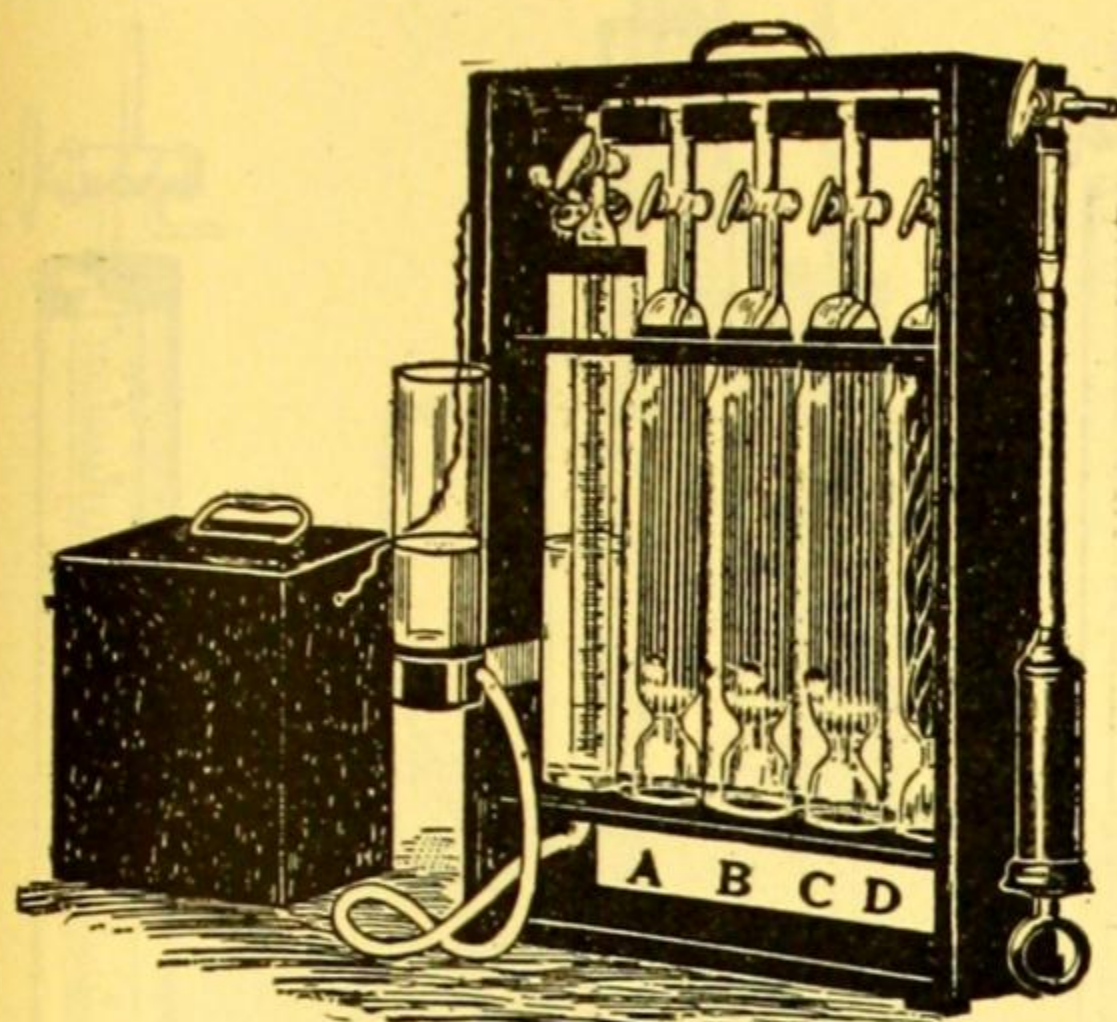


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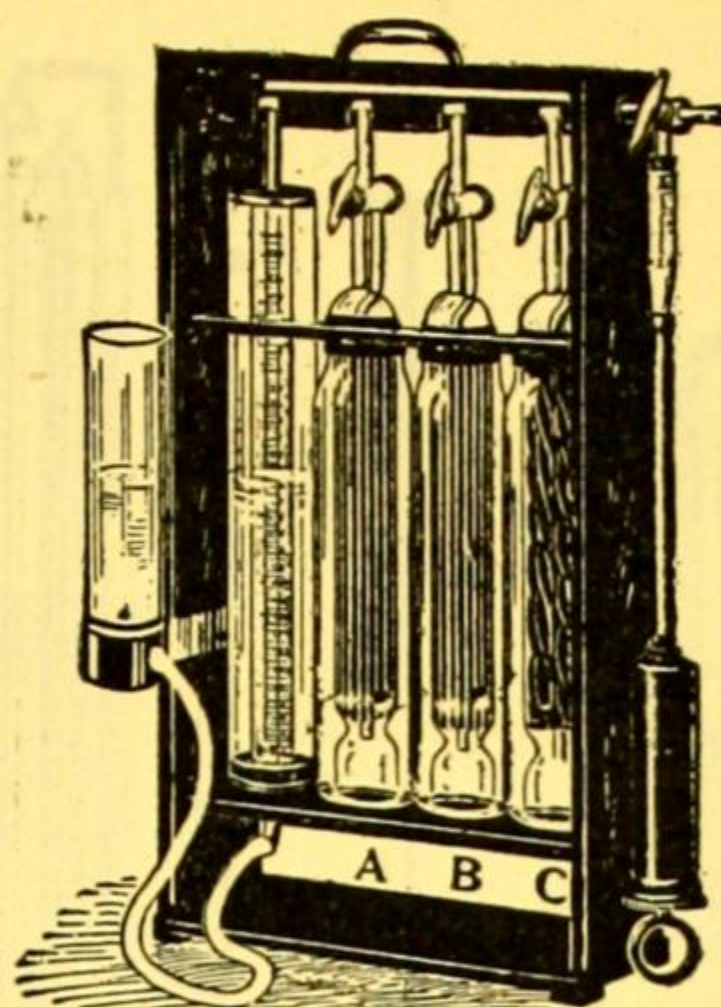


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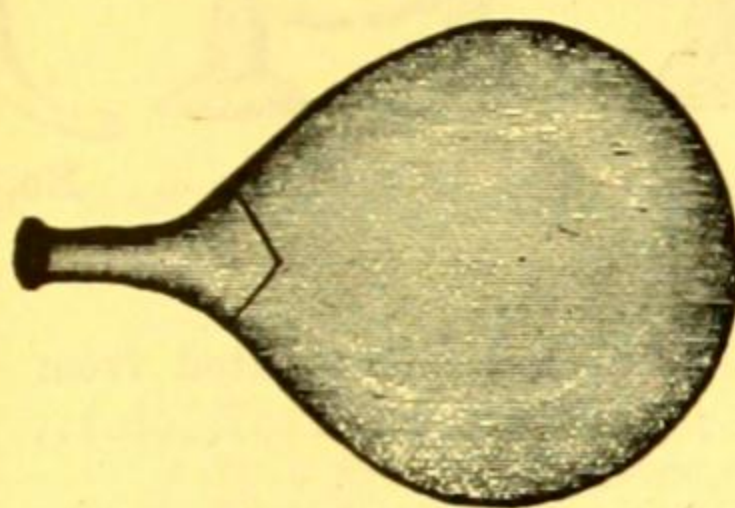
6620. **GAS ANALYSIS APPARATUS, Haldane, Portable Type, for the Determination of Small Quantities of CO₂ in Air.** Recommended by the American Public Health Association for the analysis of CO₂ in air in houses, schools and factories. The burette has a total capacity of 20 cc with stem graduated to 0.2 cc in .002 cc divisions, facilitating readings directly in volumes per 10,000. Complete in portable wooden case. (See "Methods of Air Analysis" by Dr. J. S. Haldane, 1920 Edition.)..... \$45.50
6624. **GAS ANALYSIS APPARATUS, Haldane, Portable Type, for General Analysis of Air and Gas including O₂, CO₂ and CH₄.** Used in physiological testing of air in houses, schools and factories and for investigation of furnace and mine gases. Complete in portable wooden case. (See "Methods of Air Analysis," by Dr. J. S. Haldane, 1920 edition.)..... 58.50
6628. **GAS ANALYSIS APPARATUS, Orsat-Muencke, for the analysis of CO₂, CO, and O₂, especially adapted for furnace and flue gases.** Consists of three absorption pipettes, manifold tube with four stop-cocks, measuring burette with water jacket, and aspirator bottle. Complete in portable polished wooden case..... 37.00
6629. **Extra Manifold Tube for No. 6628, with four stop-cocks** 8.00
6636. **GAS ANALYSIS APPARATUS, Orsat-Lunge, similar to No. 6628, but with four pipettes and bent palladium tube with lamp, for separate estimation of hydrogen.** Complete with drying tube, in portable polished wooden case..... 50.00
6637. **Extra Manifold Tube for No. 6636, with five stop-cocks** 12.00
- Extra Parts for Orsat Gas Apparatus Nos. 6628 and 6636.
6640. **Absorption Pipette, plain, with opening at the bottom for introducing tube**..... 1.60
6641. **Absorption Pipette, same as No. 6640, but filled with glass tubes**..... 2.50
6642. **Absorption Pipette, filled with glass tubes and copper spirals, with opening at bottom for introducing tubes** 3.00
6643. **Measuring Burette only, without water jacket** 5.00
6644. **Water Jacket only, for measuring burette**..... .80
1614. **Aspirator Bottle, 4 ounces**..... .80
6645. **Soft Rubber Bag for attaching to pipettes**..... .75
6832. **Rubber Aspirator Bulb, with two valves and rubber connections**55



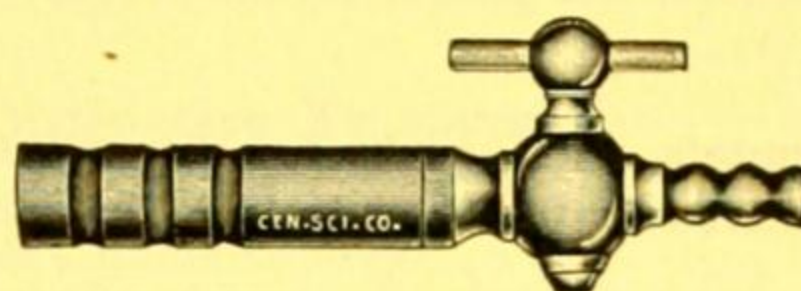
Nos. 6676-7.



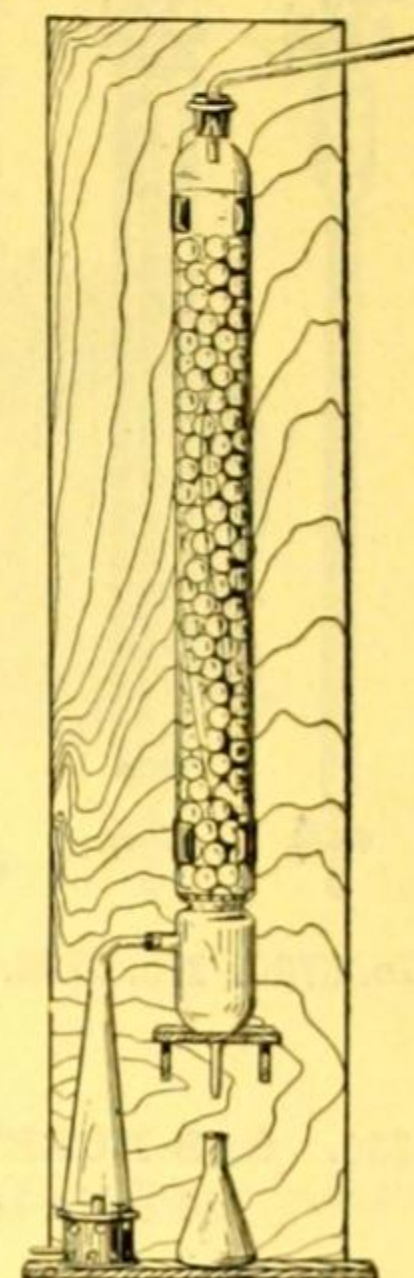
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No. 6720.

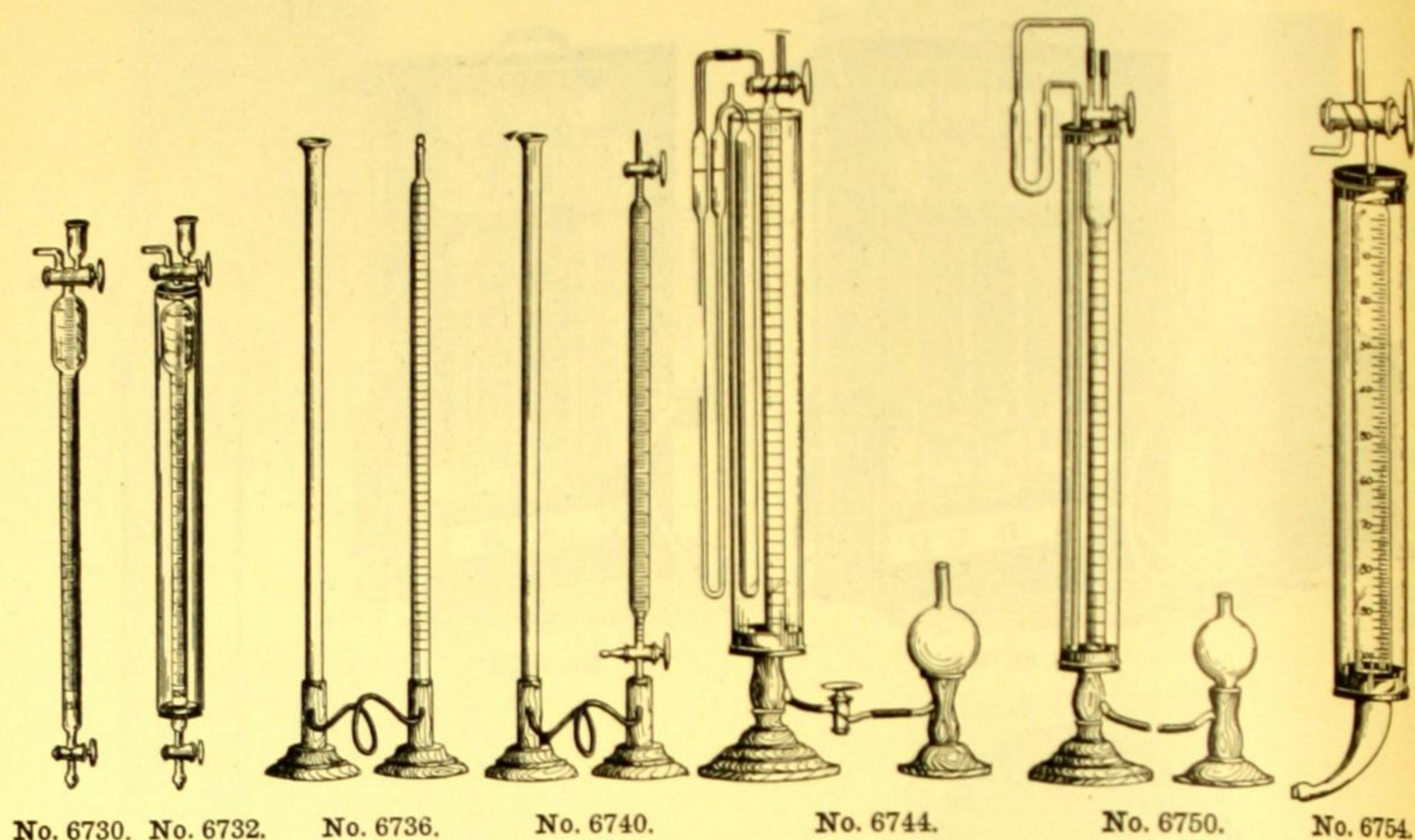


No. 12900.

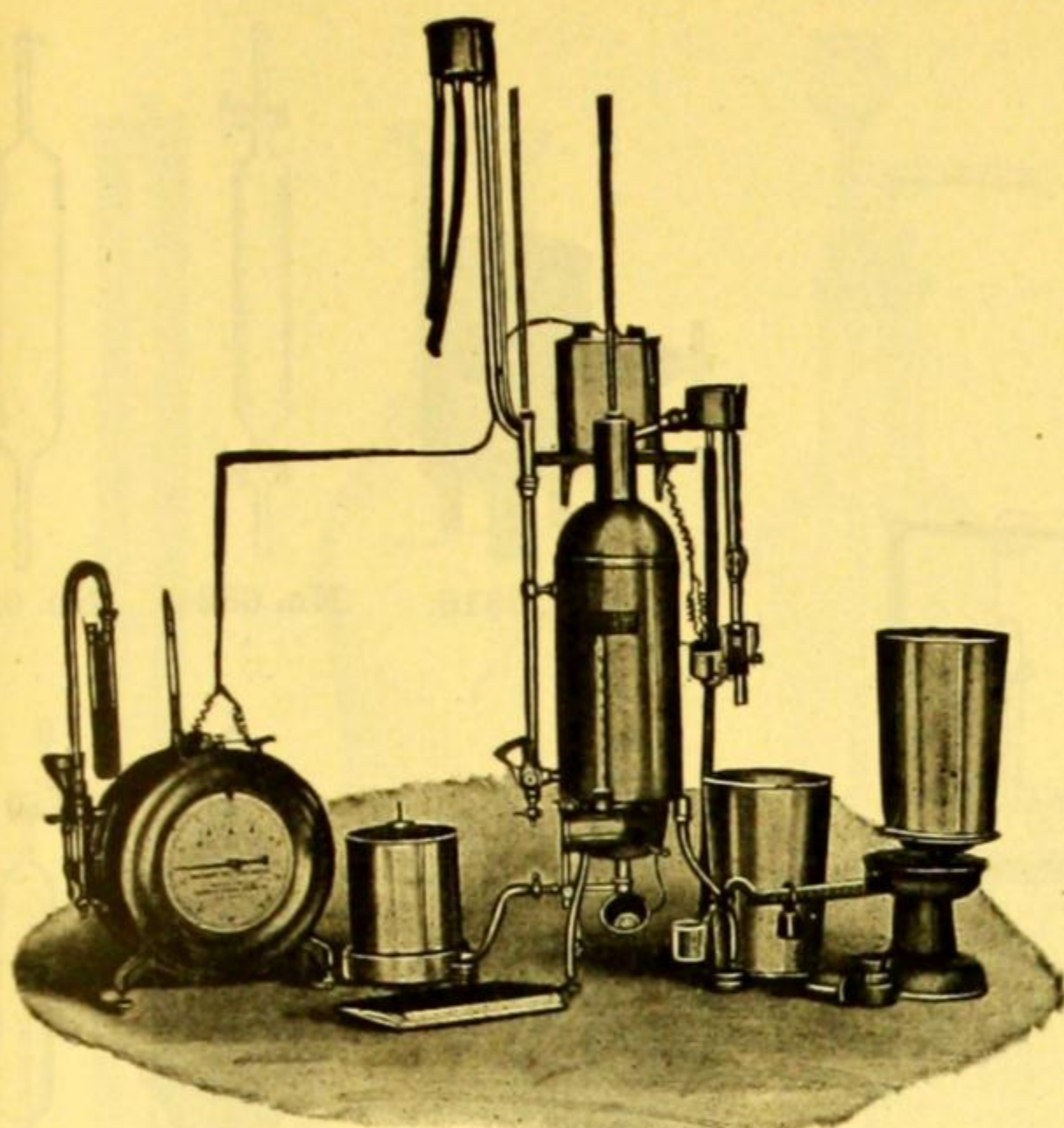


No. 6698.

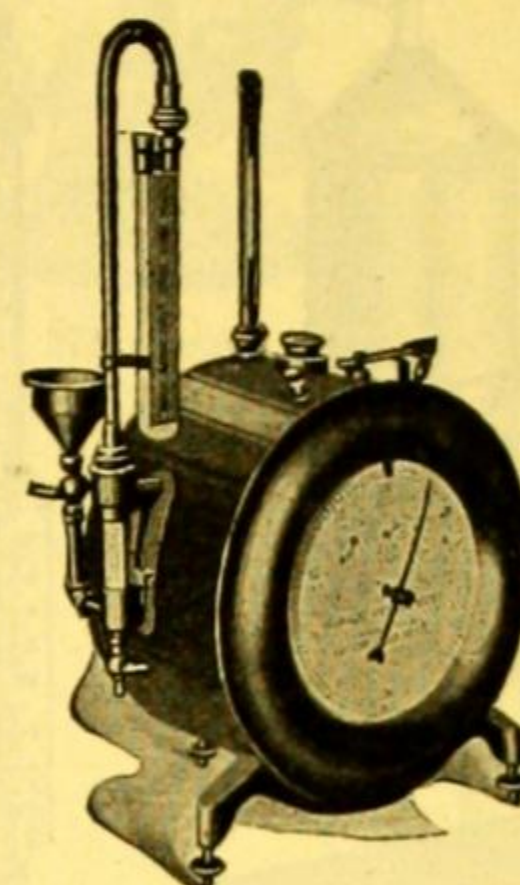
6676. **GAS ANALYSIS APPARATUS, Williams' Improved, Model A**, for the complete analysis of combustible gases, with special form of bubbling pipettes designed to increase the rapidity of absorption and to decrease the possibility of breakage. Complete with four special bubbling pipettes with stop-cocks, filled with glass tubes, manifold tube, water-jacketed measuring burette with stop-cock, leveling bottle, three-way stop-cock and aspirator pump, in polished oak case lined with rubber. Height, 17½ inches; width, 12 inches; depth, 4 inches \$65.00
6677. **Portable Explosion Coil** for use with No. 6676 in determining methane. Complete with batteries in polished oak case..... 10.00
6678. **GAS ANALYSIS APPARATUS, Williams' Improved, Model B**, for analysis of flue gases, similar in construction to No. 6676, but with three bubbling pipettes for determining CO₂, CO, and O₂. Complete with three pipettes with stop-cocks and glass tubes, manifold tube, water-jacketed burette with stop-cock, leveling bottle, three-way stop-cock and aspirating pump, in polished oak case, lined with rubber. Height, 17½ inches; width, 9½ inches; depth, 4 inches 45.00
- GAS APPARATUS, Bunsen-Fresenius**, for chlorine, see **Chlorine Absorption Apparatus**.
6698. **GAS APPARATUS, Referees'**, for Sulphur, complete as illustrated with burner and support, without flask. Described in Technologic Paper No. 20 and Circular No. 48 of the United States Bureau of Standards..... 30.00
- GAS APPARATUS, Wolpert's**, for carbon dioxide in air, see No. 146.
6720. **GAS BAG, Rubber**, oval form, without stopcock, capacity one gallon..... 5.50
12900. **STOP-COCK, Brass**, for No. 6720 Gas Bags. One end for attaching rubber tubing, the other a 5/8x2½-inch brass tube for nozzle of gas bag 1.10
6722. **GAS BAG, Rubber**, same as No. 6720, but with brass stop-cock, capacity one gallon.... 6.60
- GAS BALLOONS, Glass**, see **Balloons**.



6730. **GAS BURETTE**, Bunte's, with two stop-cocks, without water jacket. Graduated from -10 to 50 cc in $\frac{1}{10}$ th, and from 50 to 100 cc in 1 cc divisions \$4.50
6732. **GAS BURETTE**, Bunte's, same as No. 6730, but with water jacket fitted with rubber stoppers 7.50
6736. **GAS BURETTE**, Hempel's, without stop-cocks, set in heavy metal bases, with one plain burette, and one burette graduated to 100 cc in $\frac{1}{10}$ cc divisions..... 8.00
6737. **Graduated Burette** only of No. 6736..... 3.50
6738. **Leveling Tube** only of No. 6736..... 1.00
6740. **GAS BURETTE**, Hempel-Winkler, same as No. 6736, but with graduated burette provided with two stop-cocks..... 10.00
6741. **Graduated Burette** only of No. 6740 with stop-cocks 5.00
6744. **GAS BURETTE**, Hempel's, with compensating tube to correct for variations in temperature and pressure. Complete with stop-cock and leveling bulb, mounted on weighted metal bases, as illustrated 22.00
6745. **Graduated Burette** only of No. 6744, with three-way stop-cock 7.50
6746. **Leveling Bulb** for No. 6744, mounted on heavy base 5.50
6747. **Glass Bulb** only of No. 6746..... 1.10
6750. **GAS BURETTE**, Hempel-Tutwiler, with four-way stop-cock, compensating tube, manometer, water jacket, and leveling bulb, mounted on heavy metal bases..... 28.00
6751. **Graduated Burette** only of No. 6750, with special four-way stop-cock..... 10.00
6754. **GAS BURETTE**, Hempel's, modified by the Illinois Steel Company, with burette graduated to 100 cc in $\frac{1}{10}$ cc divisions, three-way stop-cock, and water jacket, **without support**..... 9.00
6755. **Graduated Burette** only of No. 6754, with special three-way stop-cock..... 7.50



Nos. 6780-8.



No. 6786.

6780. GAS CALORIMETER, Sargent's Automatic, for testing the thermal value of inflammable gases.

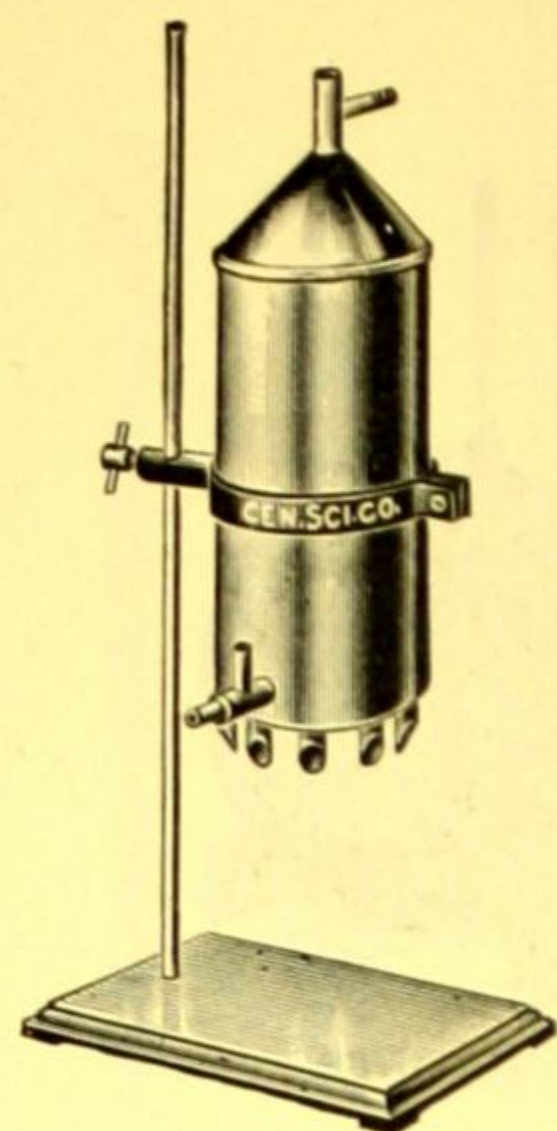
Distinctive Features.

- (1) The discharge water is weighed to one-hundredth of a pound instead of being measured in a graduate where errors are likely to occur.
- (2) The discharge water is switched automatically from one receptacle to another after each one-tenth of a cubic foot of gas is burned. This eliminates errors due to hand manipulation.
- (3) Inlet and outlet thermometers are on the same level so that they can be read almost simultaneously.
- (4) A wet pressure governor controls the pressure of the gas entering the burner, and a constant pressure is easily maintained by means of adjustable weights.
- (5) To maintain a constant flow the inlet and outlet pipes are provided with weirs. A graduated quadrant valve regulates the amount of water used.
- (6) Since a determination can be made every three or four minutes, a curve of the heat value extending over any length of time may be plotted.
- (7) The heat value of the gas is determined directly in B.T.U.
- (8) The Bunsen burner has two tips and is adjustable for gas having 100 to 1500 B.T.U. per cubic foot.
- (9) The calorimeter is made of copper and brass and is handsomely nickel-plated.
- (10) The wet test gas meter is made of heavy brass and tin and has a water level indicator outside of the gage glass. The meter is graduated to 0.001 cubic feet.

Complete as described above, with calorimeter body, wet pressure governor, wet test gas meter, special scales, pair of weighing pails, and two No. 13540 Thermometers.....\$295.00

Parts and Accessories for No. 6780.

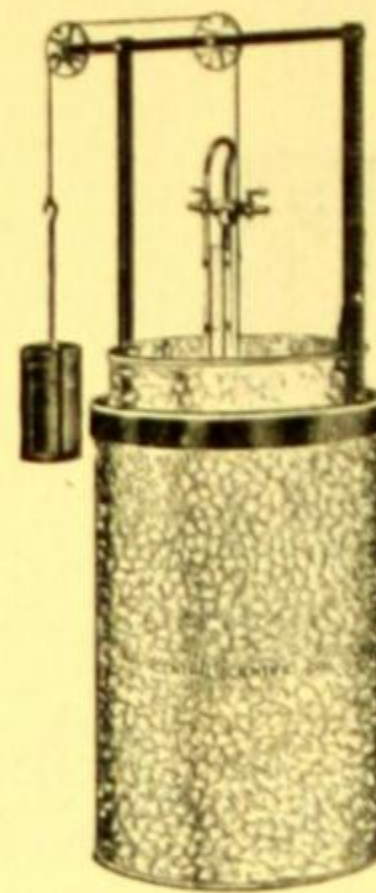
6781. Calorimeter Body, with automatic attachment, Bunsen burner, tubing, exhaust thermometer and beaker	150.00
13540. Thermometer, High Grade, graduated from 30° to 150° F. in one-tenth degree divisions, for inlet and outlet temperatures. Suitable for all ordinary work.....	9.50
6785. Wet Pressure Governor, with weights.....	20.00
6786. Wet Test Gas Meter, with all attachments.....	75.00
6787. Scales, Special, weighing to hundredths of a pound. Capacity, 10 pounds.....	20.00
6788. Weighing Pails, nickel-plated, accurately balanced	per pair 6.50
6789. Shipping Chest, specially fitted for holding a complete calorimeter outfit in separate compartments	80.00
6790. Tables of Standard Reduction Factors for Gas, in book form	1.75
6791. Heat Value Computer, U. G. I.....	4.00
13730. Reading Lens for thermometer.....	2.25



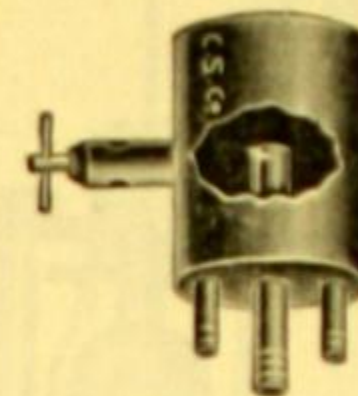
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No. 6812.



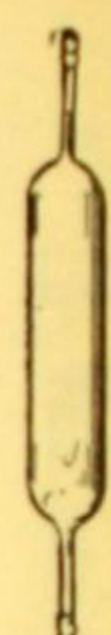
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No. 6816.



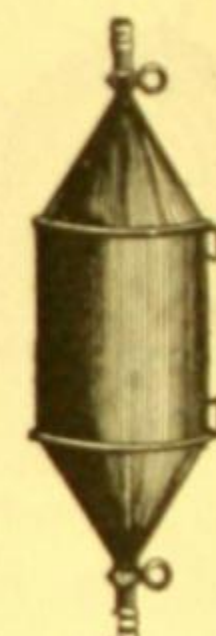
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No. 6830.



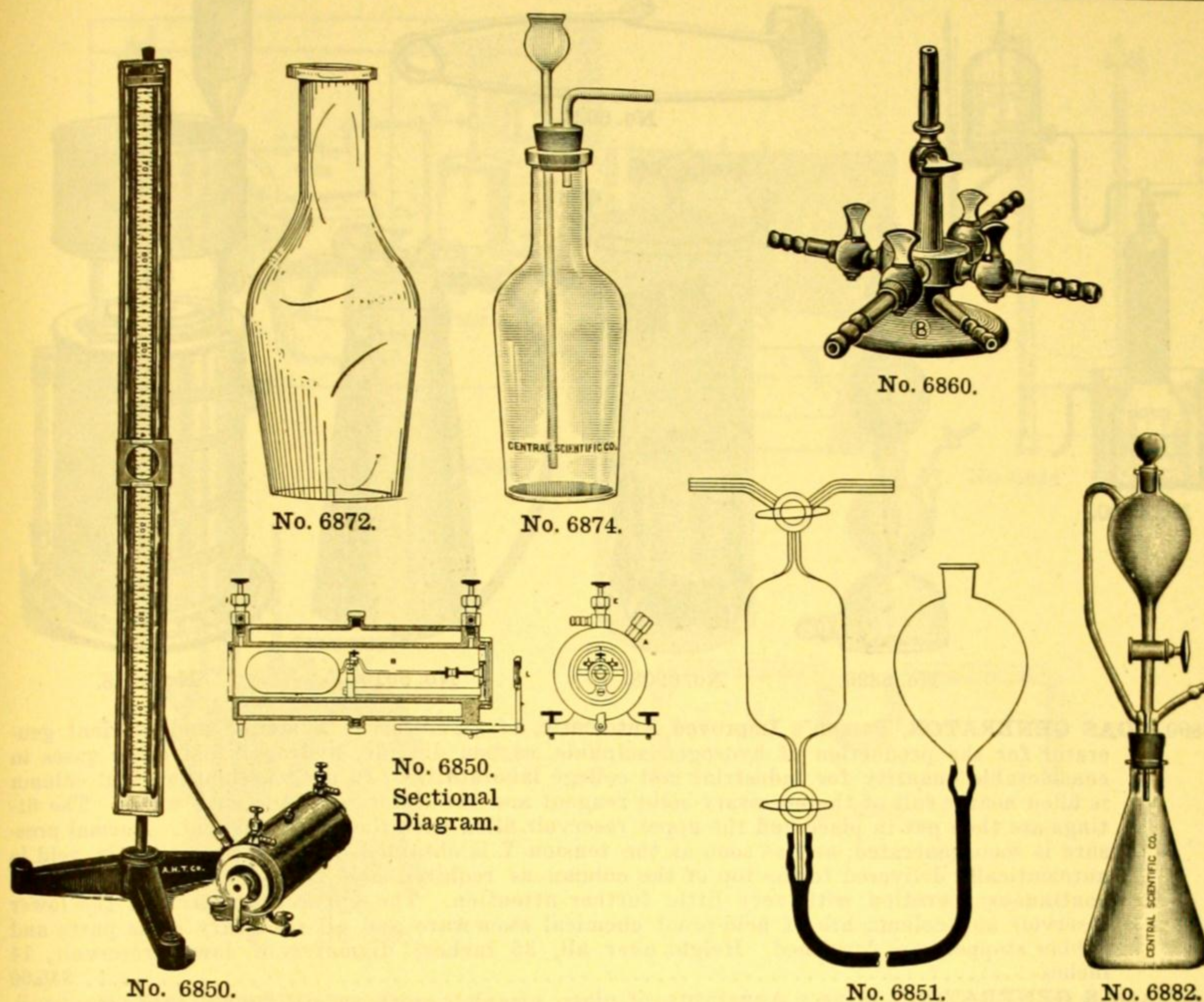
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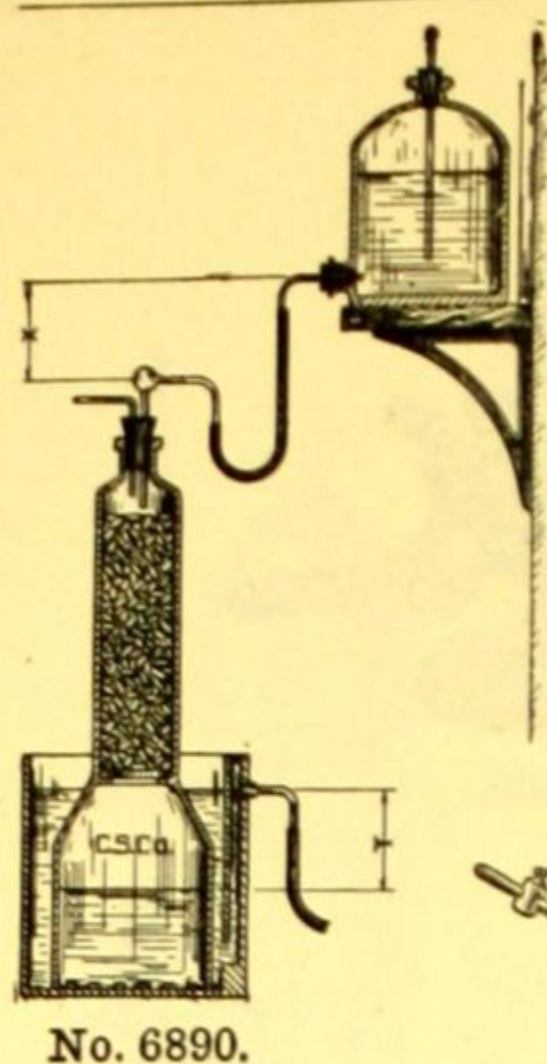
No. 6836. No. 6838.



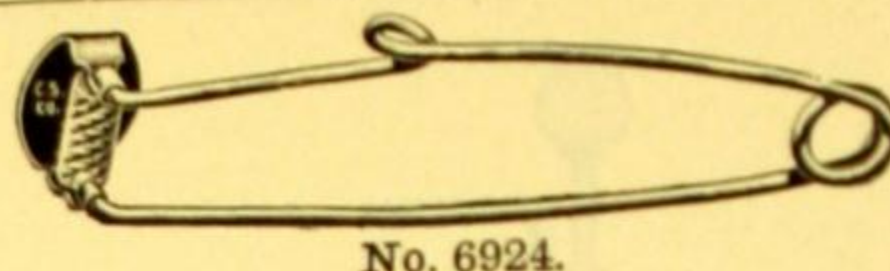
6810. **GAS CALORIMETER**, Junkers, Mann's modification, for determining the approximate heating value of gas. Consists of a double walled copper vessel provided with a number of tubes or flues so arranged as to receive the heat from a Bunsen flame. These tubes coming in contact with water which is running continuously through the Calorimeter give up their heat. A thermometer placed in the orifice at the top registers the temperature of water at delivery, a second thermometer placed in orifice at the bottom registers the temperature at entrance. Any convenient gas measuring apparatus will give the amount of gas supplied the burner. (See No. 6812 Thorp Gage, or No. 6814 Gas Meter.) A vessel placed to catch water delivered gives amount of water passing through the Calorimeter. Complete with support, but without gas meter or thermometers..... \$13.00
6812. **Thorp Gage**, a convenient means of measuring approximately both the pressure and the rate of flow of gas. When the gas supply is attached to the inlet and the cap is screwed down over the outlet at top, the index reads on left hand scale the pressure in inches of water. When testing the consumption of a burner, the pressure cap is unscrewed and the burner screwed in its place. The indicator then registers on the right hand scale the number of cubic feet of gas consumed per hour 16.00
6814. **Gas Meter, Constant Pressure**, for use with No. 6810, consisting of a galvanized iron tank in which a gas tank having a capacity of about 2 cubic feet is floated. Only a small amount of oil or water is required. The gas tank is kept in an upright position by two vertical guides, one of which is provided with a scale so graduated that readings of the contents of the tank may be made to within 0.01 cubic foot. The tank is provided with inlet and outlet stop-cocks of brass and with a manometer graduated in millimeters for indicating the gas pressure, which may be varied by means of weights placed on the tank. A counterpoise is provided both for filling the tank and for adjusting the pressure on the gas. Complete as described with weights of 1, 2 and 5 kilos and a weight hanger weighing 1 kilo..... 65.00
6816. **Constant Level Water Tank or Weir**, for use with No. 6810 Calorimeter or any other device in which the flow of water at a uniform pressure is important. Consists of a metal tank of about 350 cc capacity, provided with inlet and outlet tubes properly arranged, and with a clamp for attaching to an upright support rod of 1/2-inch diameter..... 4.00
- GAS COCKS**, see Stop-Cocks.
6824. **GAS COLLECTING TUBES**, of glass, long form, with two glass stop-cocks, capacity 250 cc 3.50
6830. **GAS COLLECTING TUBE**, Illinois Steel Company's, of glass without stop-cocks. Capacity, about 250 cc..... 1.50
6832. **GAS COLLECTING TUBE**, Rubber, double acting, for use in filling tubes and bottles with sample to be tested..... .55
6836. **GAS COLLECTING TUBE**, Winkler's, of zinc, with two brass stop-cocks. Length, 12 inches; diameter, 4 1/2 inches..... 5.20
6838. **GAS COLLECTING TUBES**, United States Bureau of Mines Form, of glass, with two stop-cocks. Capacity, 125 cc. (See Bulletin 97, United States Bureau of Mines, page 53) 6.00



6850. **GAS DENSITY BALANCE**, Edwards, developed at the National Bureau of Standards for the rapid and accurate determination of the specific gravity of gas. In point of speed it is far superior to the method of direct weighing of the gas on an analytical balance, and gives an accuracy only obtainable by the latter method when carried out with elaborate precautions. The apparatus consists of a balance beam B carrying a sealed cylinder on one end and a counterweight on the other. The balance beam with its support is mounted in a gas-tight chamber to which is attached a mercury manometer. In operation, the balance case and manometer connections are filled with dry air through the inlet I and the pressure adjusted by removing the excess gas through the needle valve E until the beam just balances, as determined by observation through the adjustable lens L of the cross line on the end of the beam. After determining this pressure, the balance is evacuated through E and filled with the gas; the pressure is then adjusted until the beam is again in equilibrium. The specific gravity of the gas is then the ratio of the total pressure (manometer reading plus atmospheric pressure) required to balance the beam in air to the total pressure required to balance it in the gas. Complete as described with manometer and mercury for charging, in carrying case with directions for use. (See Technologic Paper No. 89 of the United States Bureau of Standards) 125.00
6851. **Leveling Bottle** for No. 6850, with stop-cocks and reservoir, but without rubber tubing... 9.00
For **PUMPS** for use with No. 6850, see general heading **Pumps**.
6860. **GAS DISTRIBUTOR**, with four side tubes and center burner, all with stop-cocks..... 7.50
GAS DRYING APPARATUS, see **Drying Apparatus**.
GAS GENERATING MACHINE, see **Gas Machines** No. 6936.
6872. **GAS GENERATING BOTTLES**, without fittings.
- | Capacity, pints | $\frac{1}{2}$ | 1 | 2 |
|-----------------|---------------|-----|-----|
| Each | .17 | .25 | .35 |
6874. **GAS GENERATING BOTTLES**, same as No. 6872, but fitted with rubber stopper, funnel tube and delivery tube. Capacity, pints
- | | $\frac{1}{2}$ | 1 | 2 |
|------|---------------|-----|-----|
| Each | .50 | .55 | .65 |
6882. **GAS GENERATOR**, Dropping, Freas, an effective, cleanly, economical method of obtaining any gas desired for use. Without flask..... 4.00



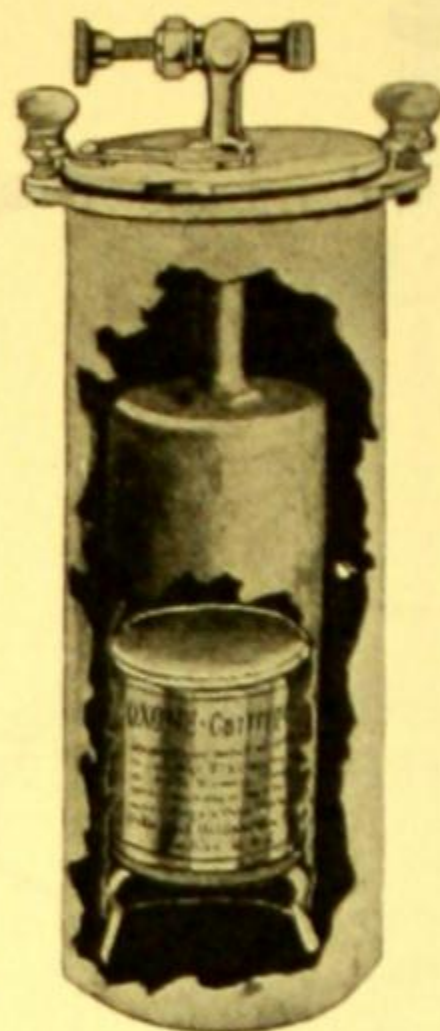
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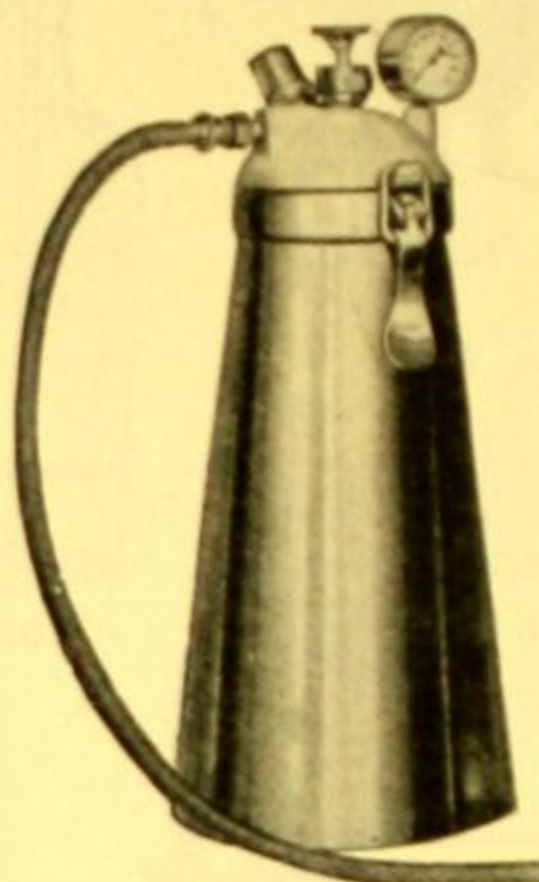
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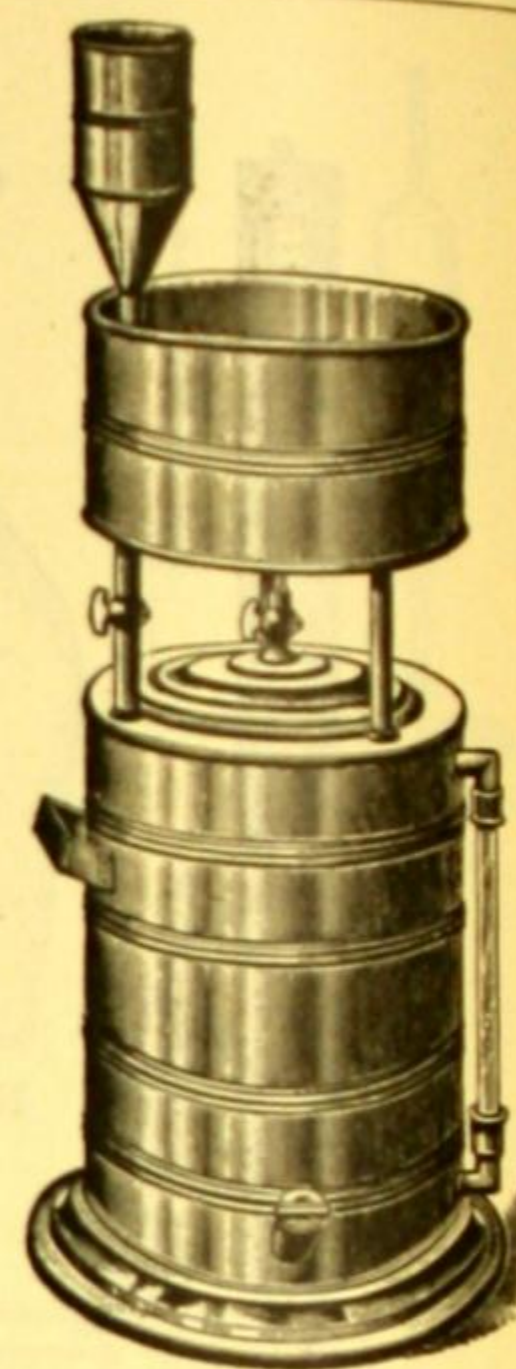
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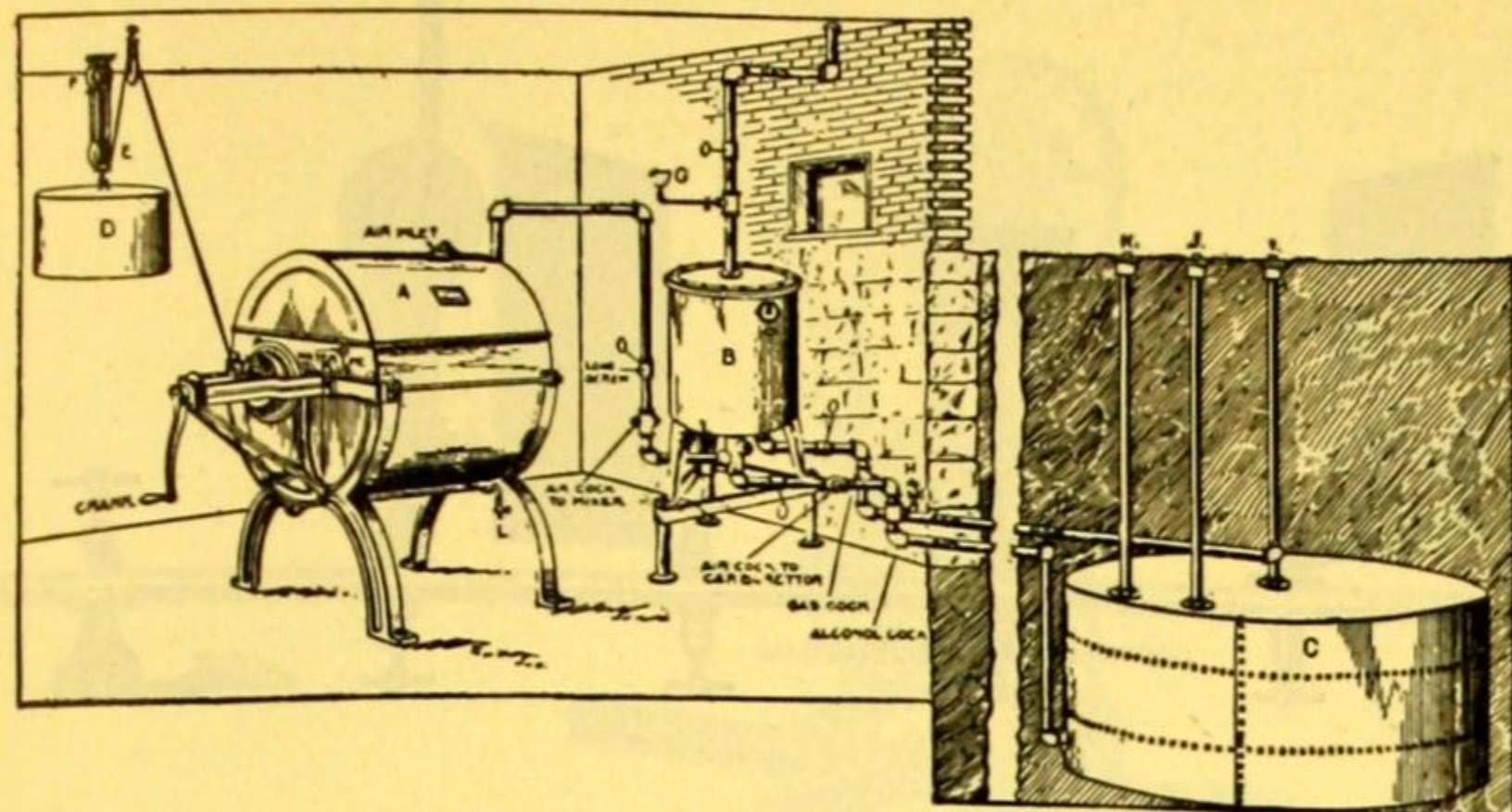


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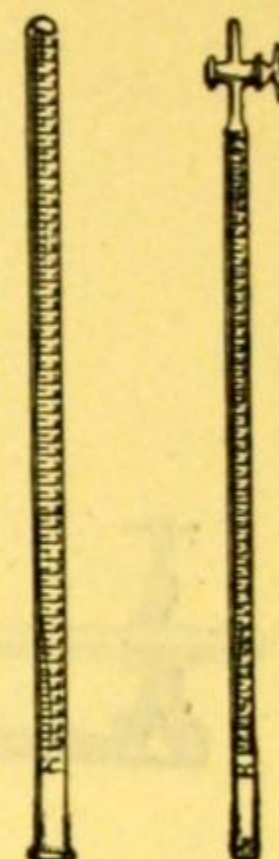


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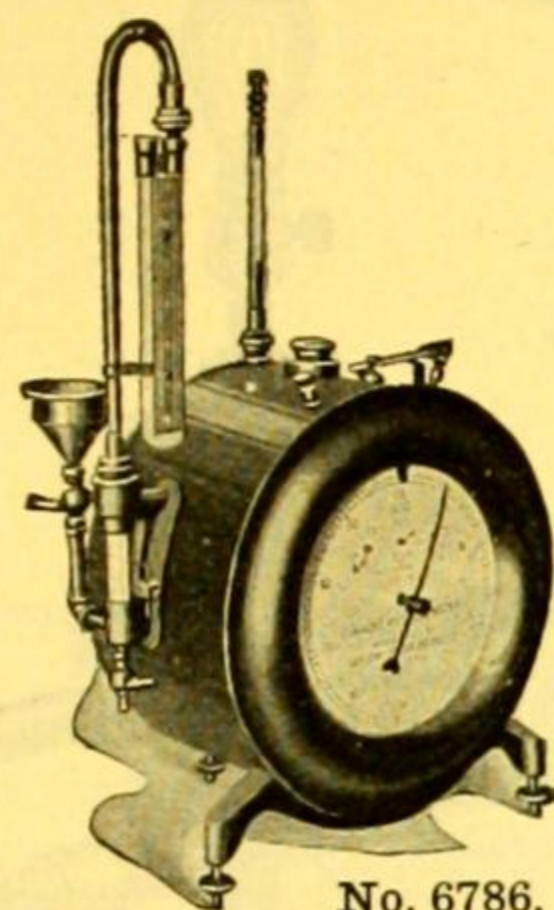
6890. **GAS GENERATOR**, Parson's Improved Automatic, of stoneware. A simple and efficient generator for the production of hydrogen sulphide, carbon dioxide, hydrogen and other gases in considerable quantity for industrial and college laboratories. In use, the long upright column is filled nearly full of the necessary solid reagent and the lower reservoir with water. The fittings are then put in place and the upper reservoir filled with the liquid reagent. Normal pressure is soon generated, and as soon as the tension Y is obtained in the lower reservoir, acid is automatically delivered to the top of the column as required and the generator is ready for continuous operation with very little further attention. The upper reservoir and the lower reservoir and column are of acid-proof chemical stoneware and all necessary glass parts and rubber stoppers are furnished. Height over all, 35 inches; diameter of lower reservoir, 14 inches. \$45.00
6896. **GAS GENERATORS**, Kipp's Apparatus, of glass, complete with safety funnel tube, stop-cock, ground-in glass stopper, and rubber stoppers. Capacity, cc. 500 1000 2000
 Each 6.00 7.60 10.00
6898. **Stop-Cock** only of No. 6896. 1.20
6200. **Funnel Tube** only of No. 6896.45
6908. **GAS GENERATOR** for Oxygen, of metal, $9\frac{1}{2}$ inches high; weight, $2\frac{1}{2}$ pounds. Generates a steady supply of pure oxygen from Oxone or peroxide of sodium in cartridge form. The cartridges come in hermetically sealed tin cans, which, when placed in the generator, are punctured. Each cartridge will furnish about 14 or 15 gallons of oxygen, which, if passed through a wash bottle containing water, will be 100 per cent. pure. As it comes from the generator it is 99.3 per cent. pure. 18.50
6909. **Cartridges** for No. 6908.80
 Each80
 Per dozen 8.00
6910. **GAS GENERATOR**, Oxygen, "Autogenor," high pressure, for producing a supply of pure oxygen from oxone at pressures up to 50 pounds. Complete as illustrated. 35.00
6911. **Oxone**, for No. 6910 in round cakes weighing $6\frac{1}{2}$ to 7 ounces and yielding 1 cubic foot each; in tins of 6 cakes. per tin 2.50
6912. **GAS GENERATOR**, Hydrogen, "Autogenor," same as No. 6910, but with special arrangement for generating pure hydrogen from Hydrone 35.00
6913. **Extra Holder** for No. 6912, for use with Oxone. By the purchase of this extra holder, the same generator may be used for both hydrogen and oxygen.75
6914. **Hydrone** for No. 6912, in tins holding 2 pounds and yielding 2.6 cubic feet per lb. Per tin 2.50
6918. **GAS GENERATOR**, Retort, for oxygen, see Retorts, Copper, No. 11462.
6918. **GAS HOLDERS** (Gasometer), Pepys-Berzelius, of heavy copper.
 Capacity, gallons 5 10
 Each 35.00 45.00
 For **CONSTANT PRESSURE GAS HOLDER**, see No. 6814.
6924. **GAS LIGHTER**, improved, producing by friction a flash of hot sparks, which will light any kind of gas or inflammable vapors.40
 Per dozen 4.30
6925. **Spark Metal Renewal** for No. 6924.15
 Per dozen 1.60



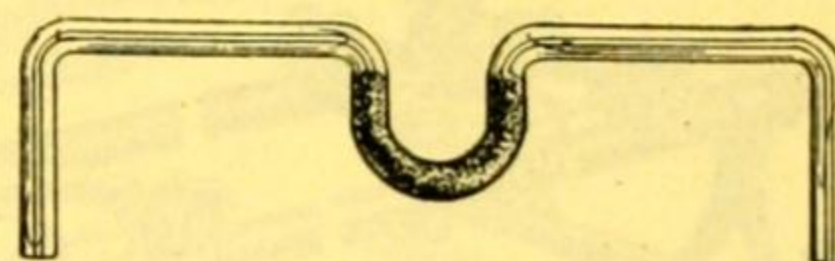
No. 6936.



No. 6944. No. 6946.



No. 6786.



No. 6962.

6936. **GAS MACHINES**, Matthews, for the automatic production of gas for laboratory use, where a source of natural or illuminating gas is not available. The machine consists essentially of a carburetor to contain the gasoline and supply the gas, an air pump or blower to furnish the air, an automatic mixer for producing the proper mixture, a weight which furnishes the motive power for the air pump, and the necessary connections. The entire process is automatic, it being necessary only to wind the weight up once a day, and to fill the carburetor once or twice a year with gasoline. There is no danger in connection with this machine and no extra insurance required as it has been passed by the National Board of Underwriters. Complete as described with air pump, carburetor, mixer, pulleys, wire rope, weight holder and all necessary connections, but not including gas pipe.

No.	A	B	C	D	E	F	G	H
Number of burners.....	30	40	50	75	100	150	200	300
Capacity of carburetor, gallons	156	202½	252	315	375	437	512	770
Number of cells.....	2	2	3	3	4	4	4	4
Ship. weight, complete, including mixer, lbs..	1150	1475	1600	2125	2525	2750	3000	3900
Each	\$415.00	505.00	560.00	645.00	795.00	960.00	1125.00	1465.00

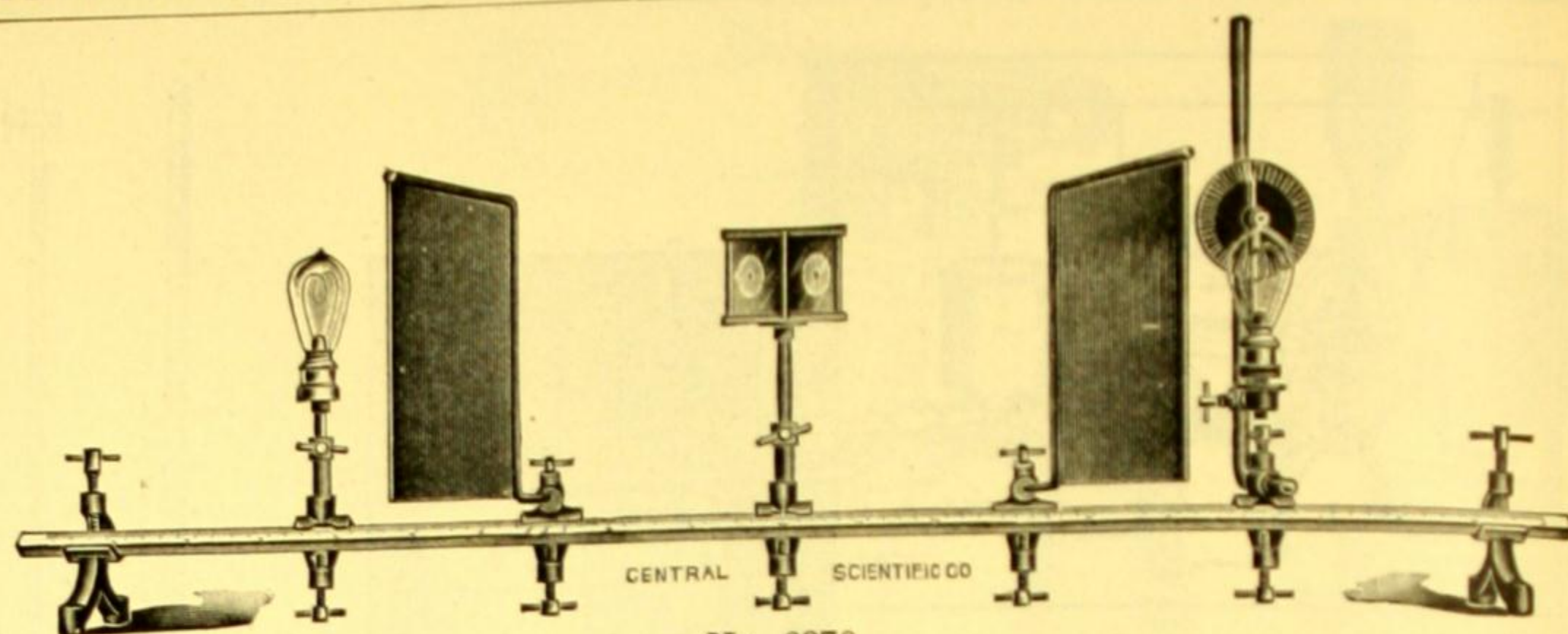
6944. **GAS MEASURING TUBES**, of glass, graduated, without stop-cock. No. B C
Capacity, cc. 50 100
Graduated in, cc. 1/10 1/5
Each

- 6946B. **GAS MEASURING TUBE**, same as No. 6944, but with glass stop-cock. Capacity, 50 cc, graduated in 1/10 cc divisions. 2.50

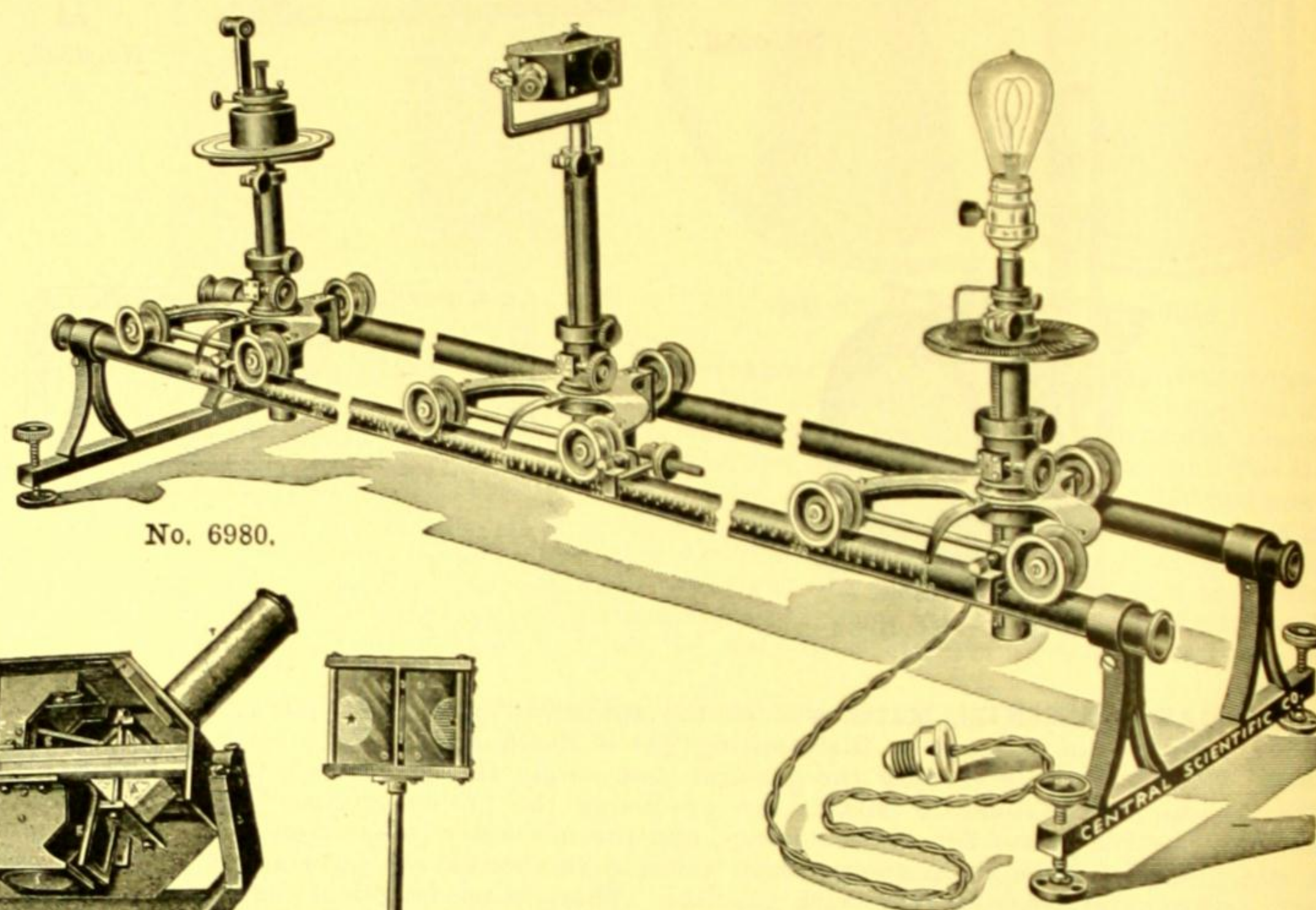
6786. **GAS METER**, Wet Test Type, with dial graduated to 1/10 cubic foot in 1/1000ths. Recording train will integrate 100 cubic feet before repeating. Provided with two spirit levels, leveling screws, filling funnel, outlet stop-cock, drain plug, gage glass, manometer, thermometer, and electric switch. Specially adapted for calorimeter work 75.00

6953. **GAS METER**, Wet Test Type, same as No. 6786, but with dial graduated to three litres in one deciliter divisions. Specially adapted for use in Plant Physiology experiments. 75.00

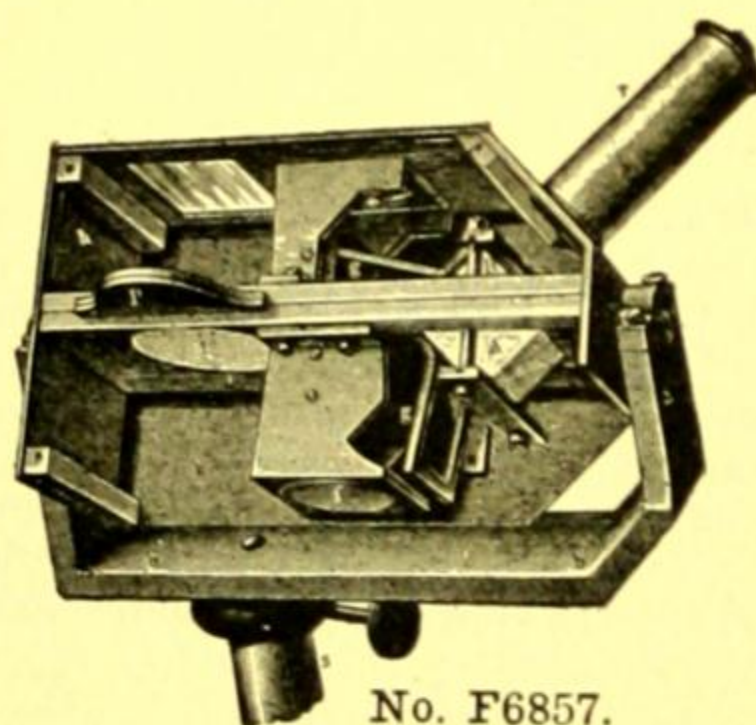
6962. **GAS PALLADIUM TUBE**, Hempel's, for hydrogen determinations, containing about 2½ grams of palladium sponge. 4.00



No. 6970.



No. 6980.



No. F6857.

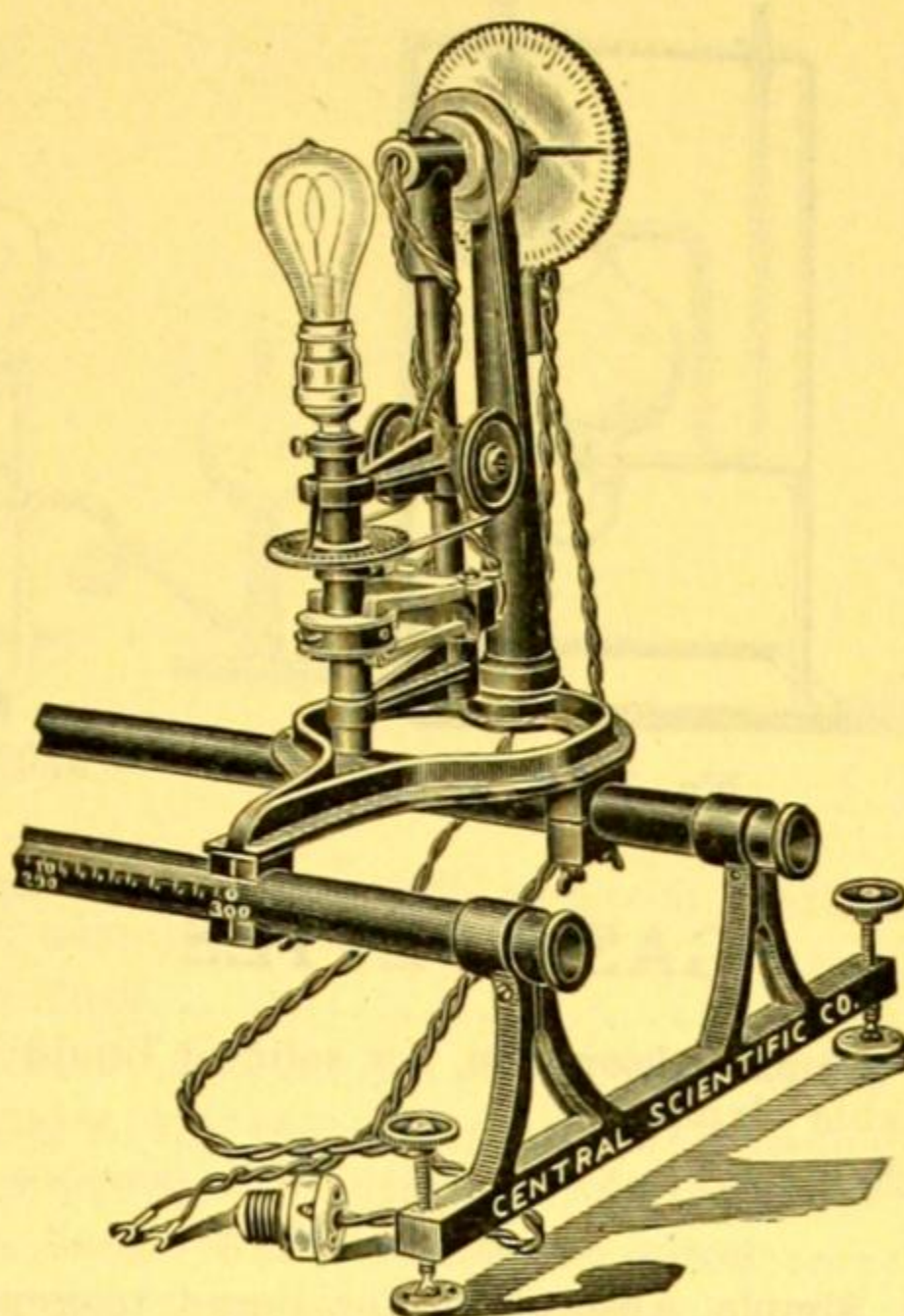


No. F6851.

6970. **GAS PHOTOMETER**, simple form, for determining candle power of illuminating gas. Consists of nicked steel rod, graduated from 0 to 200 cm in 1 mm divisions; end supports for graduated rod; two eye shades or screens with supports; Bunsen-Dibdin photometer box with clamp for supporting same; gas burner mounted on adjustable support with six-foot tip; and standard incandescent lamp, 16 candle power, 110 volts \$42.00

Parts and Accessories for No. 6970.

- F6851. **PHOTOMETER BOX**, Bunsen, Dibdin's Modification. In the Bunsen box the grease spot and its surrounding media do not transmit light equally, and in consequence the grease spot is never entirely lost, even when equal illumination is on either side. We have therefore modified the Bunsen form, according to Dibdin, and use a star of paper through which light may pass. Mounted on rod to fit No. F180 Clamp 4.50
- F6857. **PHOTOMETER BOX**, Lummer-Brodhun, contrast type, with which lights of different color values may be compared more accurately than with the disappearing type. Mounted on rod to fit No. F180 Clamp 90.00
- F6801. **CANDLE HOLDER**, for one candle, mounted on rod to fit No. F179A Clamp50
- F6803. **CANDLE HOLDER**, for four candles, mounted on rod to fit No. F179A Clamp90
- F6817. **LAMP SOCKET**, Edison, for holding incandescent lamps, mounted on rod to fit No. F179A Clamp 1.40
- F6665. **CANDLES**, Standard, sperm, six to the pound, will burn 120 grains (7.776 grams) of wax per hour Each .30

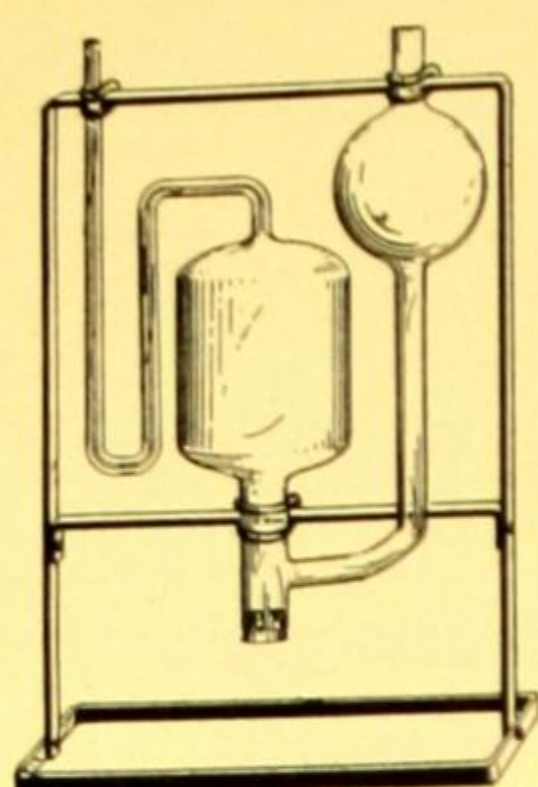


No. F6933.

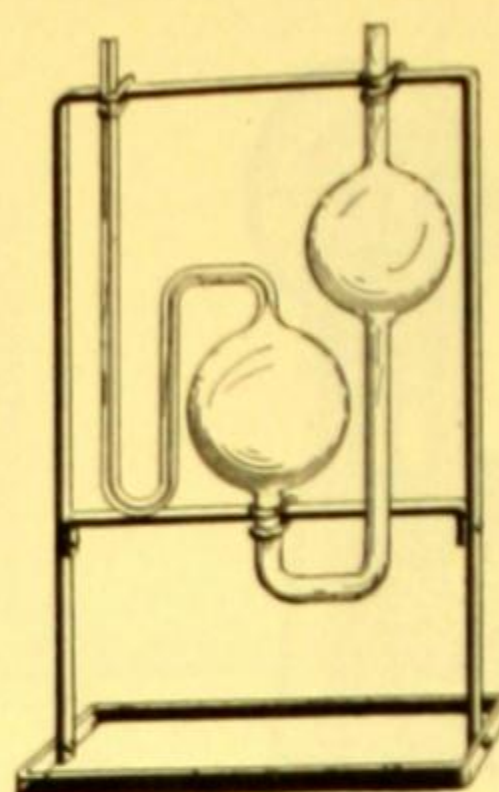
6980. **GAS PHOTOMETER, Precision Form**, designed for exact photometric work and arranged so that it may be used with a large number of accessories, adapting it for a variety of uses. The bed consists of two large brass parallel tracks, carried on supports fitted with brass leveling screws with sockets for permanent attachment to bench. The carriages are substantially made with rack-and-pinion for vertical adjustment with clamping collar to prevent slipping. A pointer extending down to the track indicates the exact location of the center. Clamps are furnished to hold the carriages at any desired point. The observing carriage is provided with a slow motion screw for careful horizontal adjustment. The carriages are constructed to take accessories with a 19 mm rod. Length of graduated portion of track, 300 cm, graduated in 1 mm divisions. Complete as described with two end carriages, observing carriage, platform for standard lamp, and Lummer-Brodhun photometer box with collar to fit observing carriage; without standard lamp or gas burner. (For illustration see preceding page.).....\$452.50

Parts and Accessories for No. 6980.

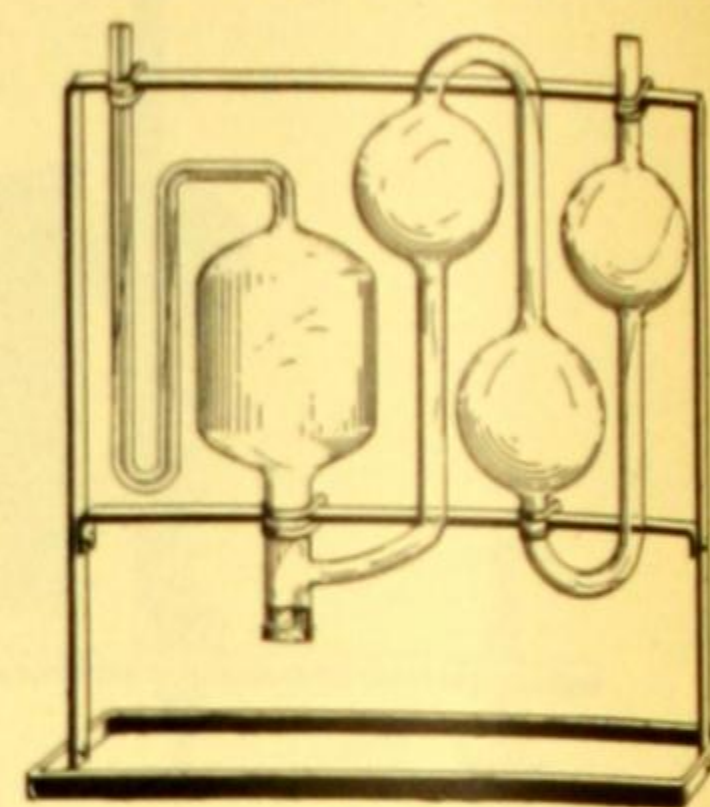
- F6923. **BED**, 3 meters between lights, graduated in millimeters 120.00
 F6924. **END CARRIAGE**, for standard or unknown illuminant 75.00
 F6925. **OBSERVING CARRIAGE**, for comparison screen 80.00
 F6926. **SOCKET**, with cord and plug, for incandescent lamp, with 19 mm rod..... 6.50
 F6927. **PLATFORM**, for standard lamp, with 19 mm rod 7.50
 F6928. **GRADUATED DISK**, to be used on end carriage with incandescent lamp to secure mean horizontal power of lamp..... 18.00
 F6931. **COLLAR**, for use on Nos. F6924-5 when it is desired to use an accessory having a rod 10 mm in diameter 5.00
 F6933. **UNIVERSAL COMPOUND ROTATOR**, for obtaining mean spherical candle power of an incandescent lamp. It consists of a heavy frame that can be clamped to the photometer track. The lamp socket is attached to a shaft mounted on ball bearings. This shaft may be adjusted in a vertical plane by angles of 5°. It is held to the desired angle by a pin fitting into a slot in the periphery of an accurately graduated disk. The horizontal position of the lamp is read on another graduated circle. The rotator is provided with two sets of brushes, one for delivering the lighting current to the lamp, the other for leads to the electrical measuring instruments. The rotator is also provided with all necessary pulleys and belt and may be driven by any 1/12 H. P. motor..... 180.00
 F6805. **GAS BURNER**, with 6-foot tip, mounted on rod to fit No. F179A Clamp..... 1.20
 F6807. **GAS BURNER**, Welsbach, complete, mounted on rod to fit No. F179A Clamp..... 2.00
 For **COLLAR** for use with Nos. F6805-7, see No. F6931.



No. 7020.



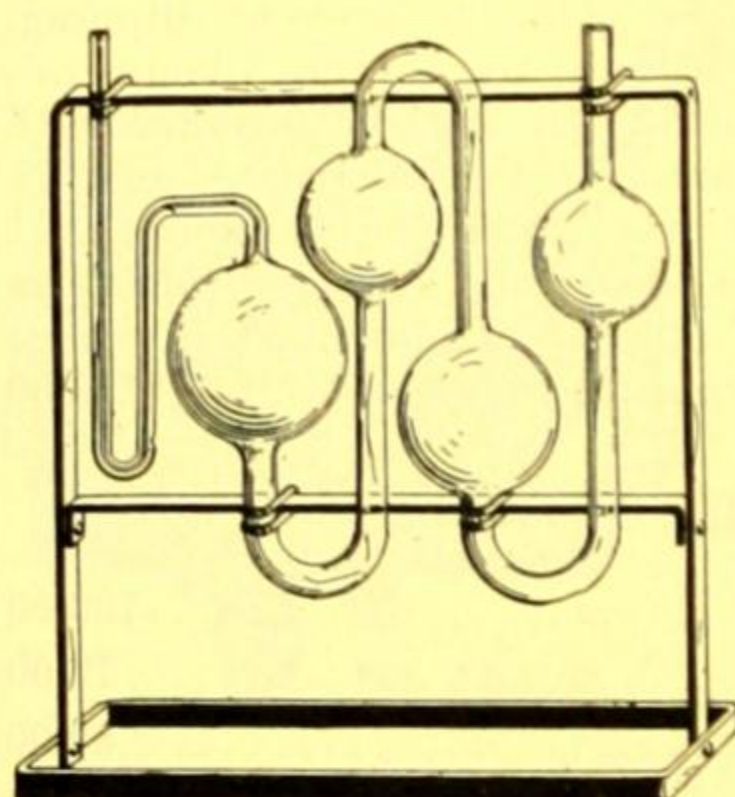
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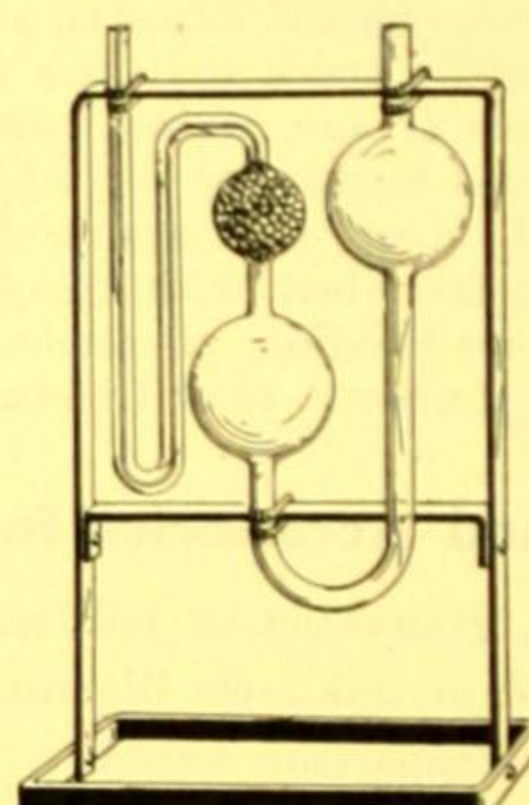
No. 7028.

GAS PIPETTES

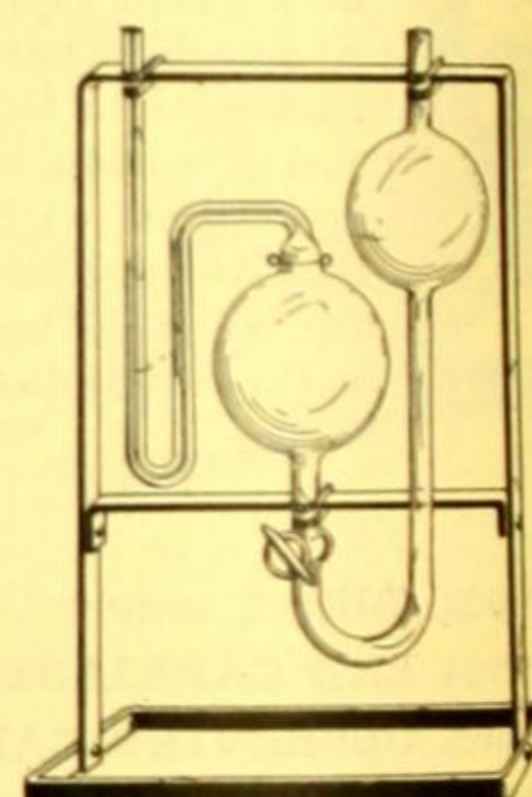
7020.	GAS PIPETTE, Hempel's Simple Absorption, for solid or liquid reagents, mounted on japanned iron support with adjustable clamps.....	\$5.25
7021.	Glass Parts only of No. 7020.....	2.50
7022.	Support only for No. 7020.....	2.75
7024.	GAS PIPETTE, Hempel's Simple Absorption, for liquid reagents only, mounted on iron support	4.25
7025.	Glass Parts only of No. 7024.....	2.00
7026.	Support only for No. 7024.....	2.25
7028.	GAS PIPETTE, Hempel's Double Absorption, for solid and liquid reagents, mounted on iron support	6.75



No. 7032.

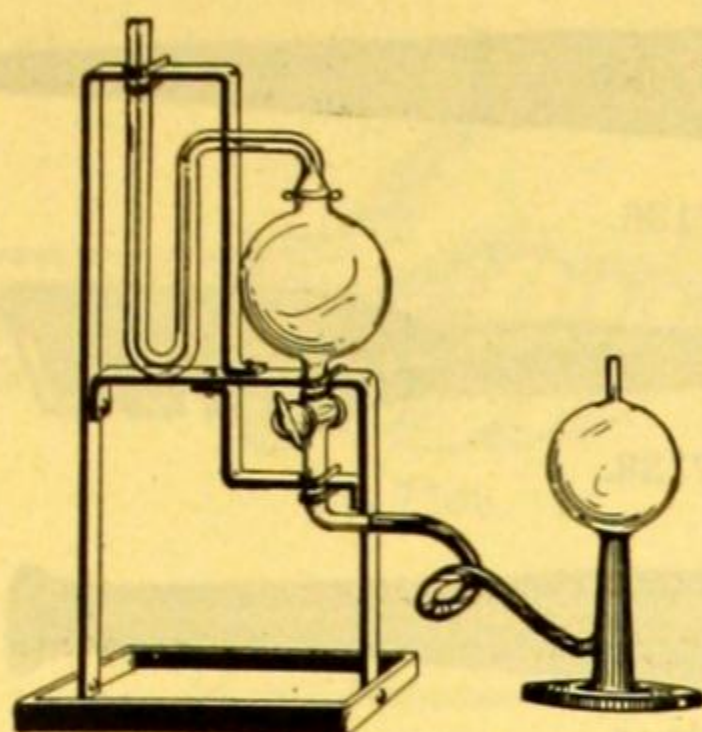


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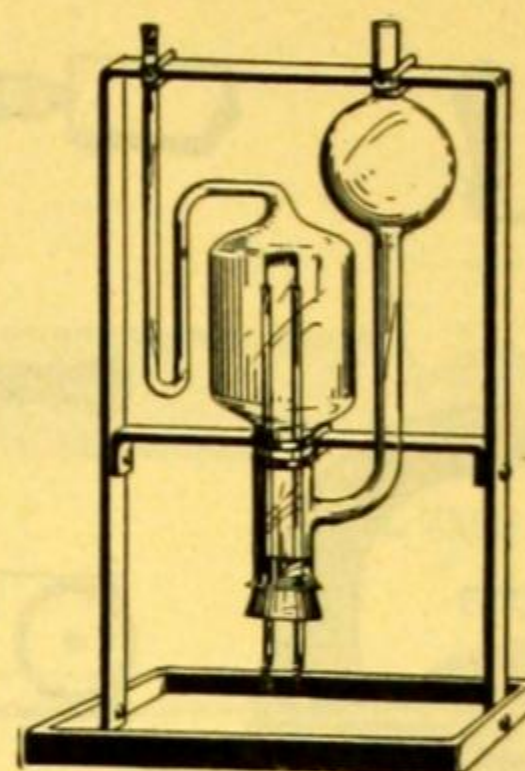


No. 7040.

7029.	Glass Parts only of No. 7028.....	3.50
7030.	Support only for No. 7028.....	3.25
7032.	GAS PIPETTE, Hempel's Double Absorption, for liquid reagents only, mounted on iron support	6.75
7033.	Glass Parts only of No. 7032.....	3.50
7034.	Support only for No. 7032.....	3.25
7036.	GAS PIPETTE, Hempel's Simple Absorption, for Ethylene, with glass beads, mounted on iron support	6.25
7037.	Glass Parts only of No. 7036.....	4.00
7026.	Support only for No. 7036.....	2.25
7040.	GAS PIPETTE, Hempel's Simple Explosion, with glass stop-cock and platinum electrodes, mounted on iron support.....	9.25
7041.	Glass Parts only of No. 7040.....	7.00
7026.	Support only for No. 7040.....	2.25

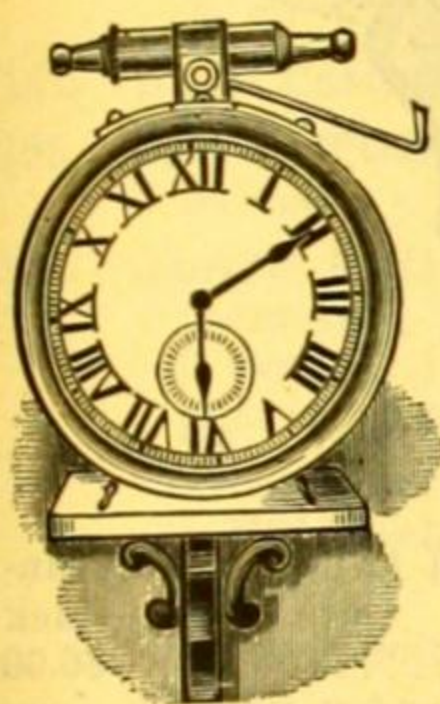


No. 7044.



No. 7060.

7044. **GAS PIPETTE, Hempel's Explosion**, with stop-cock, platinum electrodes, separate leveling bulb and connecting tube, mounted on iron support \$12.50
7045. **Glass Parts only of No. 7044**..... 7.00
7046. **Support only for No. 7044**..... 5.50
7060. **GAS PIPETTE, Winkler's**, for the determination of methane, with removable platinum spiral, mounted on a metal support with adjustable clamps 8.75
7061. **Glass Parts only of No. 7060. Without platinum spiral** 4.00
7062. **Platinum Spiral only of No. 7060**, mounted in a double glass tube..... 2.00
7022. **Support only for No. 7060**..... 2.75



No. 7076.



No. 7094.



No. 7096.



No. 7102.

GAS PLIERS, see Pliers.

GAS PRESSURE REGULATOR for oxygen tanks, see Nos. 6552 and 6553.

GAS REGULATORS, thermostatic, see Thermo-Regulators.

7076. **GAS TIME REGULATOR**, for shutting off supply of gas at any desired time. Consists of a valve controlled by a lever, mounted on a specially constructed clock. Regulator is placed in the line between gas burner and supply tap. With $\frac{1}{8}$ th inch passage through valve... 6.50

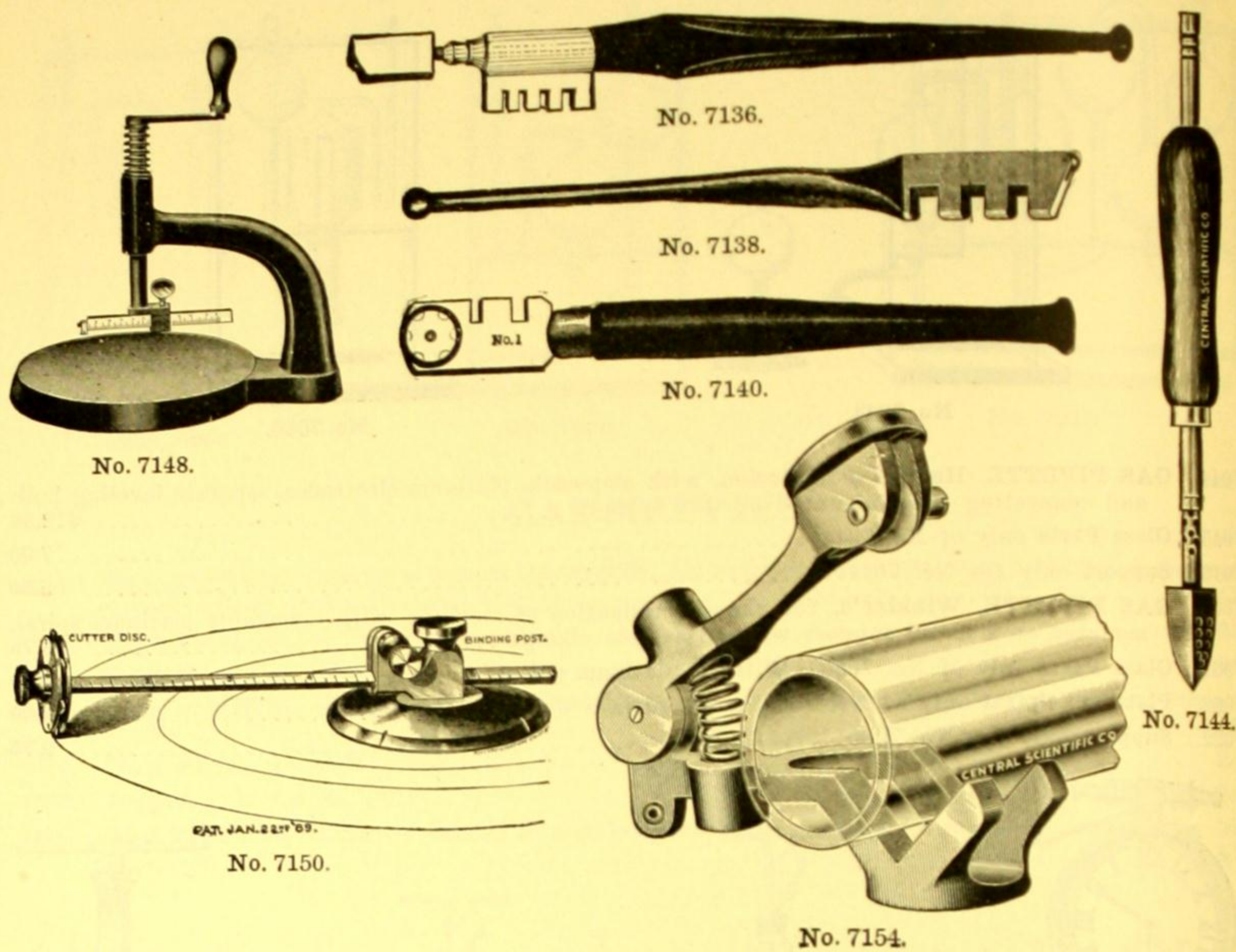
GAS WASHING BOTTLES

- | | | | |
|--|------|------|------|
| 7094. GAS WASHING BOTTLES, Drechsel's high form, with tubes ground into neck. | | | |
| Capacity, cc..... | 125 | 250 | 500 |
| Each | 1.10 | 1.50 | 1.80 |
| 7096. GAS WASHING BOTTLES, Drechsel's low form, with tubes ground into neck. | | | |
| Capacity, cc..... | 125 | 250 | 500 |
| Each | 1.20 | 1.70 | 2.00 |
| 7102. GAS WASHING BOTTLES, plain form, with rubber stopper and fittings. | | | |
| Capacity, cc..... | 250 | 500 | 1000 |
| Each | .40 | .50 | .60 |

GAUZE, WIRE, see Wire Gauze.

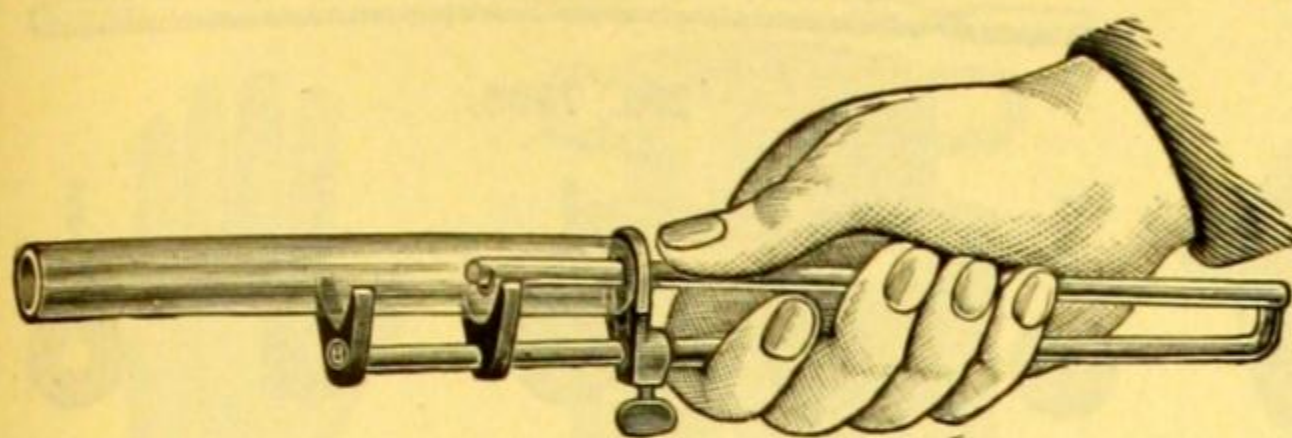
GLASS BALLOONS, see Balloons, Glass.

7128. **GLASS BEADS**, with hole through center, from 4 to 6 mm in diameter.....Per pound 2.00
7129. **GLASS BEADS, Solid**, about 3 to 4 mm in diameterPer pound 2.75

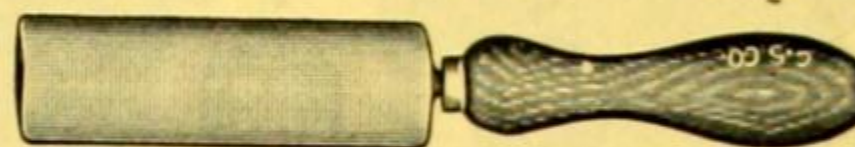


GLASS CUTTERS, ALL KINDS

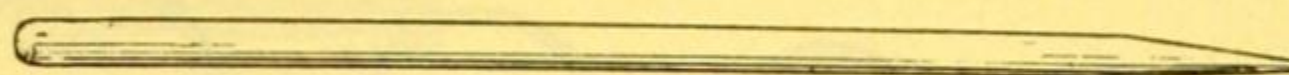
7136. **GLASS CUTTER**, Glazier's Diamond, for cutting or writing on glass. Wood handle nicely finished; metal parts nickel-plated. Diamond can be reset several times. Cuts single-thick glass \$6.00
7138. **GLASS CUTTER**, Steel Wheel, polished and bronze finish12
7140. **GLASS CUTTER**, Steel Wheel, having six cutting wheels in a turret head which may be revolved on or clamped to the frame. The cutters are protected when not in position for use30
7141. **Extra Cutting Wheels** for No. 7140..... Per dozen .70
7144. **GLASS CUTTING TOOL**, Parker's, designed to replace the hot file as an instrument for cutting glass by leading a crack in the desired direction. Consists of a heavy pointed copper head, attached to a gas supply tube with wooden handle, the whole constituting a burner. When the air and gas supply are regulated to cause the flame to strike back, the head becomes intensely hot and can be used to cut glass into almost any shape desired, although not at a very rapid rate. (See Journal of American Chemical Society, Vol. XL, No. 1, January, 1918, page 195.) 1.80
7145. **GLASS CUTTING TOOL**, Parker's, same as No. 7144, but adjusted for use with natural or gasoline gas 2.25
7148. **GLASS DISK CUTTER**. Will cut disks from 1 to 20 cm in diameter. The cutter arm is graduated in millimeters and provided with turret head having six cutting wheels as in No. 7140. The apparatus can also be used for cutting disks of cardboard, metal and other materials. (For Extra Cutting Wheels see No. 7141.) 17.50
7150. **GLASS DISK CUTTER**, with cutting disk at end of 13 inch adjustable graduated arm, with six steel cutting wheels; mounted on heavy brass base faced with rubber on under side... 5.25
7151. **Extra Cutting Wheel Disk** for No. 7150, with six wheels..... 1.80
7154. **GLASS TUBING CUTTER**. The pressure on the cutting wheel may be regulated so as to be firm and even. Will cut tubing up to 1½ inches in diameter..... 1.20
7155. **Extra Cutting Wheel** for No. 7154..... .10
- GLASS INK**, see Diamond Ink No. 3816.
- GLASS PLATES**, see Plates, Glass.



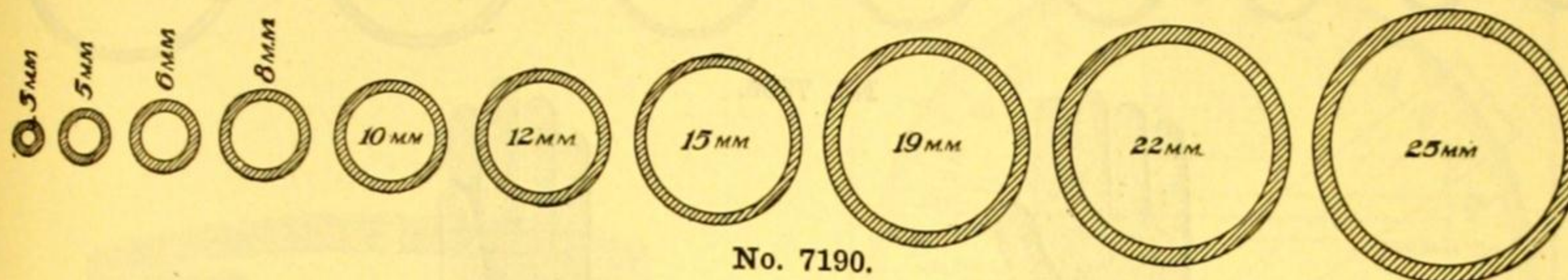
No. 7160.



No. 7168.



No. 7182.



No. 7190.

7160. GLASS TUBING CUTTER for cutting tubing from inside. The glass tube is held in fiber rests so that the cutting wheel describes a perfect circle. Length, 12 inches; cuts glass of from $\frac{3}{8}$ to 1 inch inside diameter up to 8 inches length \$1.50

7161. Extra Cutting Wheel for No. 7160..... .20

7168. GLASS TUBING CUTTER, a highly tempered steel knife with wooden handle. Both sides can be used50

7180. GLASS ROD, best quality lead free glass, in lengths of about five feet. From 3 to 13 mm in diameter. Diameters are subject to usual factory variations. Rod in smaller quantities than 5 pounds if desired in full lengths should be so specified, otherwise lengths convenient for packing may be sent. An additional charge will be made for selecting rod gauged accurately.

Diameter, mm	3	4	5	6	7	8	9	10	11	13
Per pound	.70	.70	.60	.60	.50	.50	.45	.45	.45	.45

25% discount in lots of 100 pounds of the same size.

Please specify diameter in ordering.

7182. GLASS RODS, Stirring, with ends well annealed. Size, inches..... $5 \times \frac{1}{8}$ $8 \times \frac{3}{16}$ $10 \times \frac{1}{4}$
Per dozen25 .40 .50

7184. GLASS ROD, soft glass, for sealing in platinumper pound 2.00

7190. GLASS TUBING, best soft glass, lead free, for glass blowing, bending, etc., in lengths of about five feet. Diameter and thickness of wall are subject to usual factory variations.

An additional charge will be made for selecting tubing gaged accurately inside or outside.

Tubing in smaller quantities than 5 pounds, if desired in full lengths, should be so specified, otherwise lengths convenient for packing may be sent.

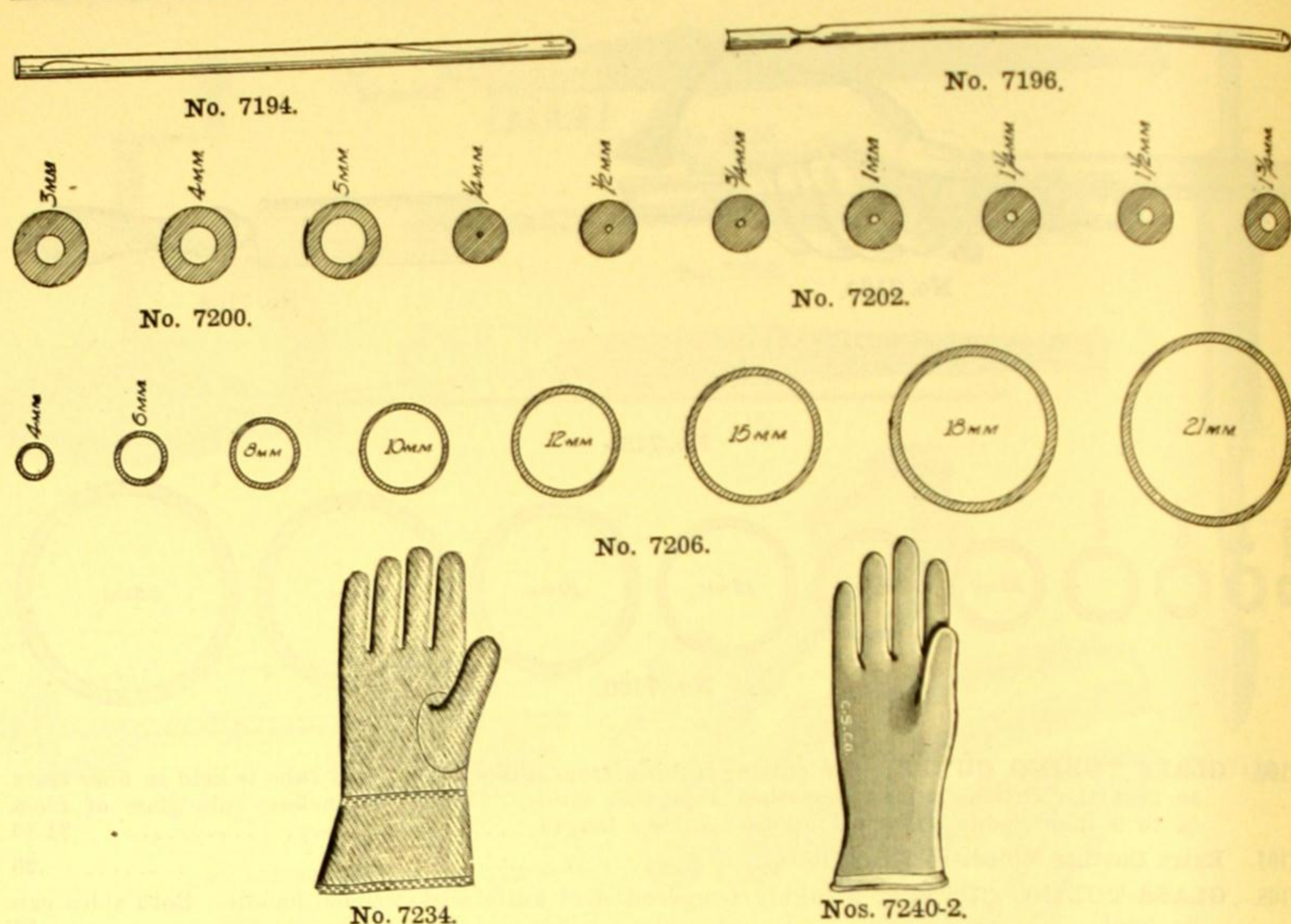
Orders for assorted tubing above 25 mm must be for 5 pounds or more; orders for assorted tubing from 13 to 25 mm must be for 2 pounds or more; from 3 to 12 mm for 1 lb. or more.

Diam. outside, mm..	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Approx. ft. per lb..	75	63	47	38	31	27	23	21	19	18	17	16	15	14
Per pound	1.00	1.00	.70	.70	.60	.60	.60	.55	.55	.50	.50	.50	.45	.45
Diam. outside, mm..	17	18	19	20	21	22	23	24	25	32	35	38	43	50
Approx. ft. per lb..	13	12	11	8	7	6	6	$5\frac{1}{2}$	$5\frac{1}{2}$	3	3	2	1	1
Per pound	.45	.45	.45	.45	.45	.50	.50	.50	.50	.55	.55	.55	.65	.80

25% discount in lots of 100 pounds of the same size.

7192. GLASS TUBES, Annealed Ends. Glass tubes of large diameter are not satisfactory unless ends are annealed to prevent longitudinal cracking. We list below a few sizes but can supply any size desired. No.....

	A	B	C	D	F	G	H	J	K	M
Diameter outside, cm.....	2.5	2.5	2.5	2.5	2.5	3	3	4	4	4
Length, cm	30	60	75	100	150	100	120	45	60	100
Each	.35	.60	.70	.75	.80	1.10	1.20	.90	1.10	1.75
No.	N	R	S	T	V	W	X	Y	Z	
Diameter outside, cm.....	4	5	5	5	5	5	5	5	5	5
Length, cm	110	20	30	38	60	75	90	120	150	
Each	1.80	.70	1.10	1.20	1.30	1.60	1.70	2.60	2.80	



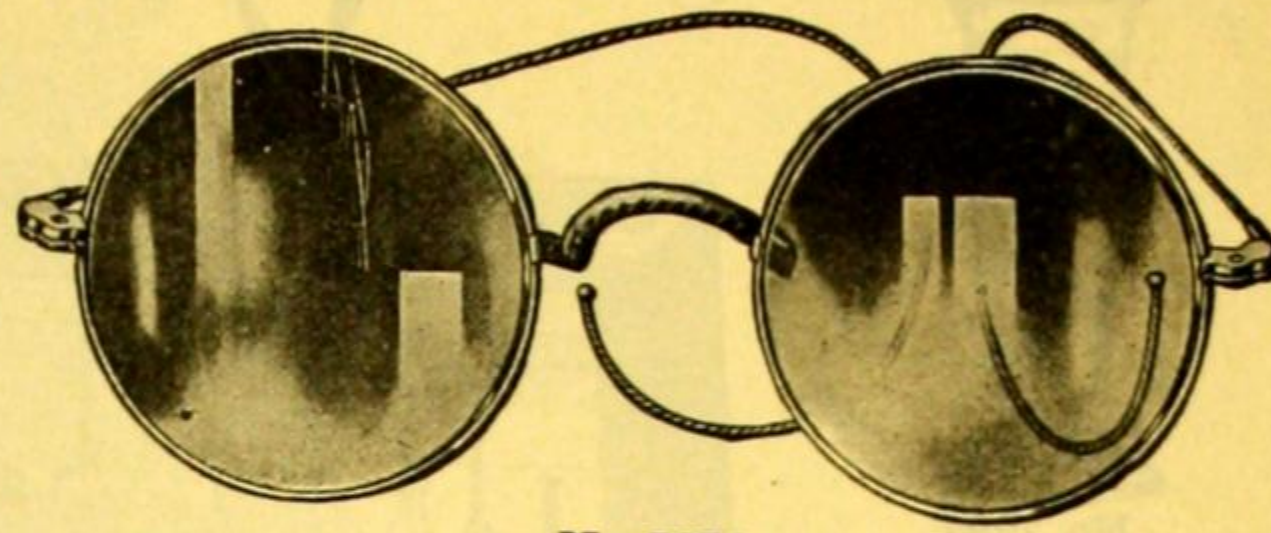
7194. **GLASS TUBES, Bomb**, for Carius and other explosion furnaces, of heavy soft glass, with one end closed. Length, 60 cm; diameter outside, 22 mm..... \$0.80
Note:—Other sizes will be made to order.
7196. **GLASS TUBES, Bomb**, for sealing, of heavy soft glass with constriction for sealing off. Length, 70 cm; diameter outside, 22 mm..... 1.10
7200. **GLASS TUBING, Barometer**, heavy wall, outside diameter from 6 to 10 mm. In 3 foot lengths.
 Diameter of bore, mm..... 3 4 5
 Per pound..... .85 .85 .85
7202. **GLASS TUBING, Capillary**, from 5 to 7 mm outside diameter.
 Diameter of bore, mm..... $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 $1\frac{1}{4}$ $1\frac{1}{2}$ $1\frac{3}{4}$
 Per pound..... 1.00 1.00 1.00 1.00 1.00 1.00 1.00
7206. **GLASS TUBING, Combustion, Pyrex**, of the same composition as the Pyrex boiling ware. Its high melting point, low coefficient of expansion and resistance to mechanical stresses, make it especially adapted for combustion work. In 36 inch lengths only.
 Diameter, inside, mm.... 4 5 6 7 8 9 10 11 12 13 15
 Thickness of wall, mm.... 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.5 1.5 1.5 1.5
 Approx. ft. per lb..... 48 42 32 24 22 20 16 $10\frac{1}{2}$ 10 $9\frac{1}{2}$ 9
 Per pound..... 1.15 1.15 1.15 1.15 1.00 1.00 1.00 1.15 1.15 1.15 1.15
 Diameter, inside, mm..... 16 17 18 19 20 21 22 23 24 25
 Thickness of wall, mm..... 1.5 1.5 2 2 2 2 2 2 2 2
 Approx. ft. per lb..... 9 8 $7\frac{1}{2}$ 7 $6\frac{1}{2}$ $6\frac{1}{2}$ 6 6 5 4
 Per pound..... 1.15 1.15 1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.20
 10% discount in lots of 50 lbs., 20% discount in lots of 100 lbs.
7212. **GLASS TUBES, Combustion**, see Combustion Tubes, page 152.
7220. **GLASS TUBING, Thermometer**, with white back, 6 to 7 mm in diameter..... Per pound .80
GLASS WOOL, for filtering, etc..... Per ounce .35
 Per 4 ounces .80
 Per pound 2.00
- GLOBES, Deflagrating**, see Deflagrating Globes.
7234. **GLOVES, Asbestos, Fingered**, with gauntlet to protect wrists. Size, extra large. Per pair 5.75
7240. **GLOVES, Rubber, black, medium weight**.
 Size No. 8 9 10
 Per pair75 .75 .75
 (Example:—Kid glove No. 8 takes rubber glove No. 10.)
7242. **GLOVES, Rubber, tight fitting**, made of thinnest pure gum, as used by surgeons in operating.
 Size No. 7 8 10
 Per pair70 .70 .70
 Kindly give size of usual kid glove in ordering.



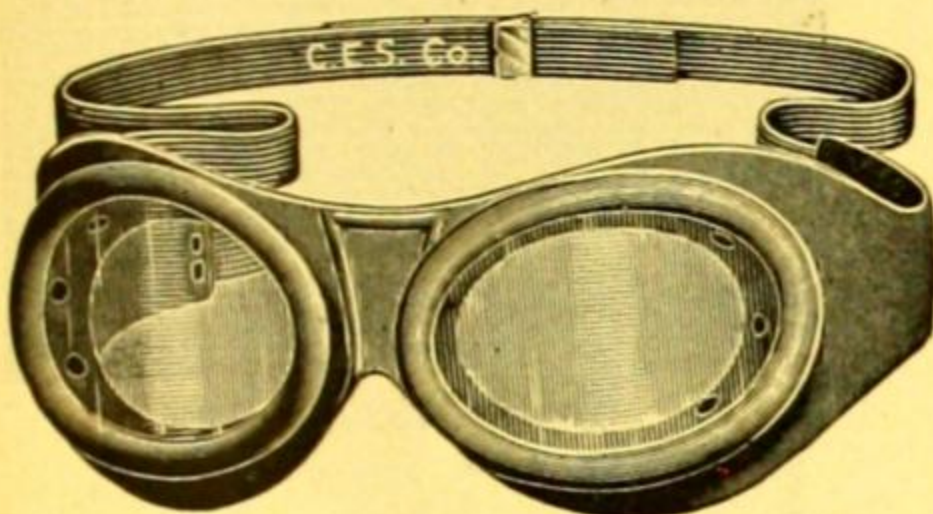
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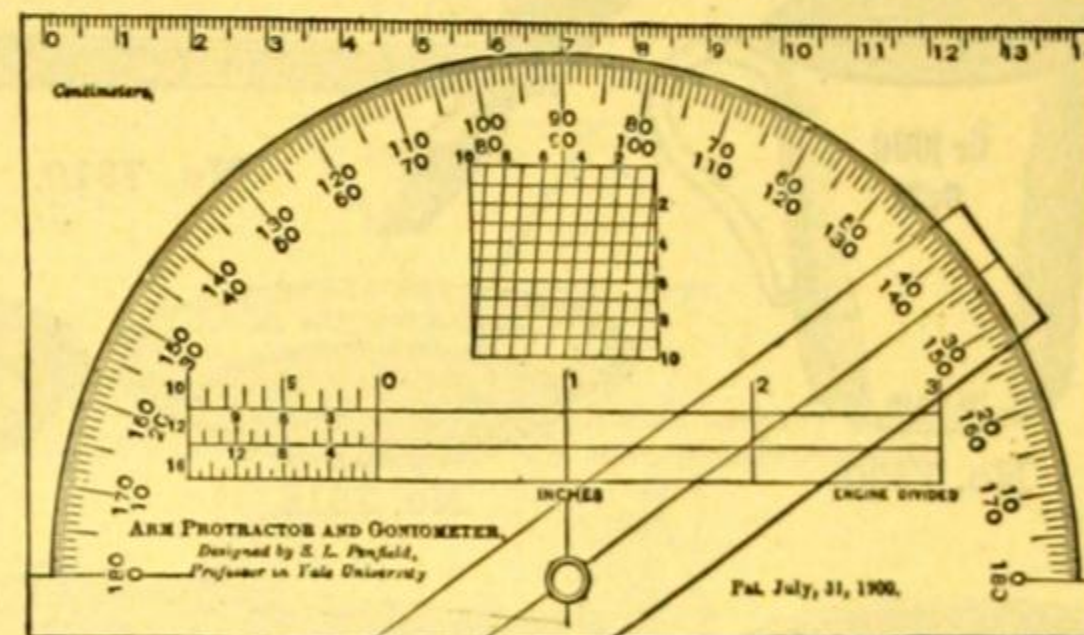
No. 7254.



No. 7274.



No. 7270.



No. 7288.

7246. **GLOVES, Rubber, Acid Gloves**, loose fitting, cloth lined, with gauntlets, for handling acids in the laboratory.

Size No.	6	8	9
Per pair	\$2.50	2.50	2.50

7247. **GLOVES, Rubber, Acid Gloves**, extra heavy, loose fitting, cloth lined, with gauntlets, used where a heavy glove is desired in plant or laboratory for handling acids or acid materials. Size No. 12per pair 3.70

7254. **GLUE, Le Page's.**

	Bottle	Can	
Size	Small	4 oz.	8 oz.
Each	.30	.40	.70
			1 lb.
			1.20

7256. **GLUE, Marine, waterproof.**.....Per ounce bottle .25

7270. **GOGGLES, Rubber, gas tight**, with clear glasses lined with mica to prevent transmission of heat 1.00

7274. **GOGGLES, Blue Glass**, called Bessemer glasses. Widely used for inspection work in connection with steel furnaces, cement kilns, etc..... .80

7280. **GOLD BEATER'S SKIN**, 6 inches square..... .15

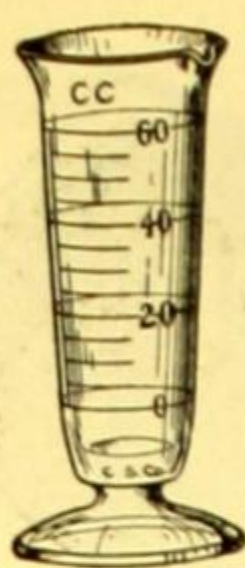
7288. **GONIOMETER AND PROTRACTOR, Penfield's.** A graduated semicircle printed on a heavy card, with an arm of transparent celluloid, swiveled on an eyelet at the center of the semicircle. A fine index line on the under side of the celluloid arm indicates the angle. The instrument is also an accurate goniometer for measuring plane angles. The millimeter scale, English is also an accurate goniometer for measuring plane angles. The graduation of the semicircle are diagonal scale, scales for 10ths, 12ths, and 16ths of inches, and graduation of the semicircle are all engine divided. Each instrument placed in a stout manila envelope with complete printed instructions by Prof. Penfield. Dimensions about 8x15 cm.....60

7290. **GONIOMETER, Contact, Penfield's Model B.** As it is difficult to adjust a transparent edge in exact contact with some surfaces, a modified form of No. 7288 is made for measuring crystals, having the celluloid arm opaque for a portion of its length. Dimensions about 6x10.5 cm. .60

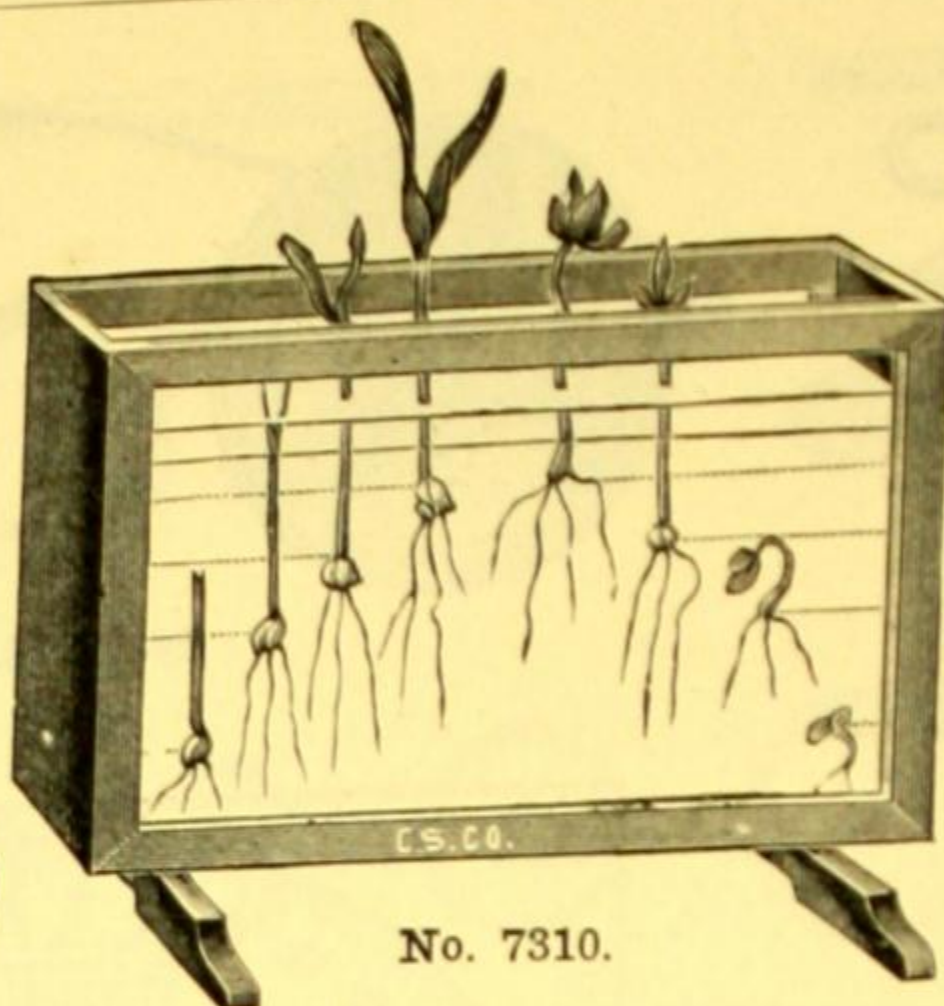
For other **PROTRACTORS**, see **Catalog F of Physical Apparatus.**

GRADUATES

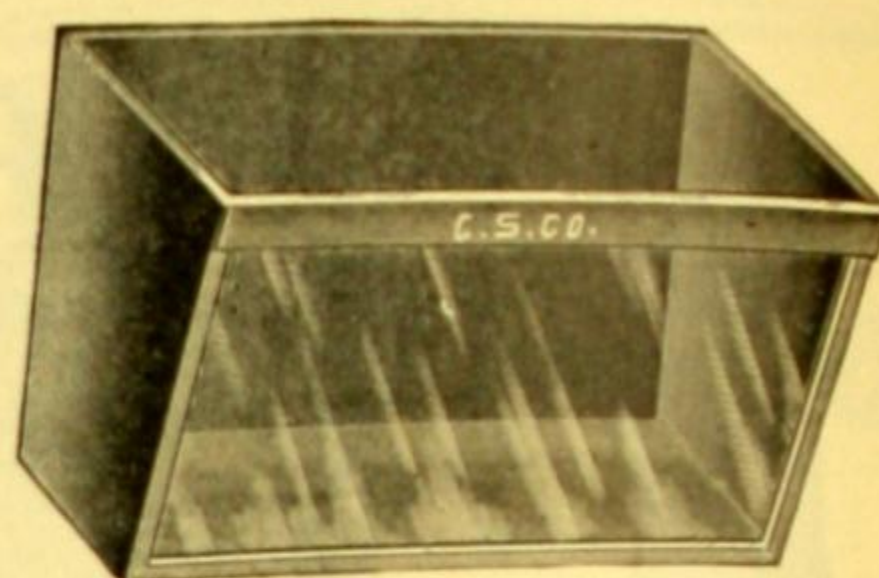
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 7292.



No. 7310.



No. 7312.



No. 7300.



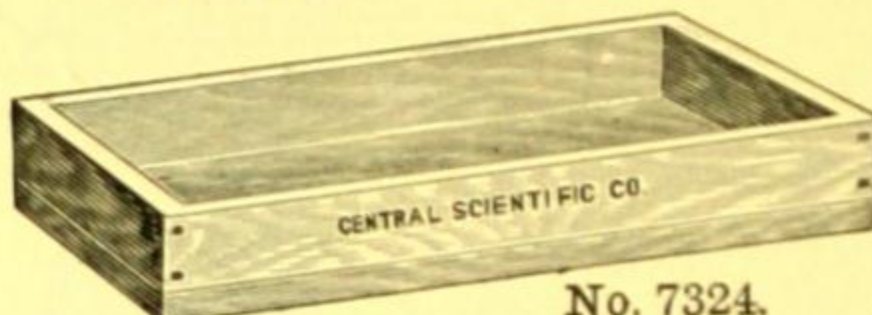
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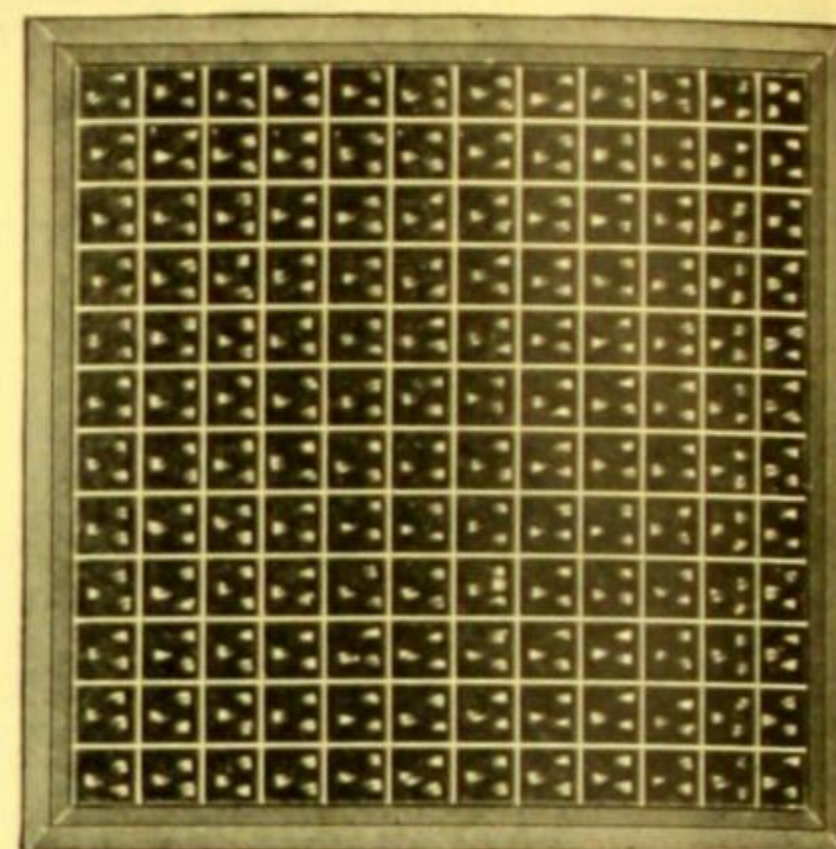
No. 7320.



No. 3592.



No. 7324.



No. 7322.

GRADUATES, Cylindrical, see Cylinders, Graduated.							
7292.	GRADUATES, Glass, Bureau of Standards Cone Shape, metric measure, graduated to meet the requirements of the U. S. Bureau of Standards and to pass all state requirements.	Capacity, cc	30	60	120	250	500 1000
	Each		\$0.50	.55	.65	.80	1.25 2.40
7294.	GRADUATES, Glass, Bureau of Standards Cone Shape, same as No. 7292 but with metric and English measure, double graduation.	Capacity, ounces	1	2	4	8	16 32
	Capacity, cc	30	60	120	250	500	1000
	Each		.60	.65	.90	1.20	1.80 3.00
7300.	GRADUATES, Enamelled Ware, seamless, graduated on the inside in cc and ounces.	Capacity, cc				500	1000
	Each					1.70	2.20

GRAIN TESTING APPARATUS

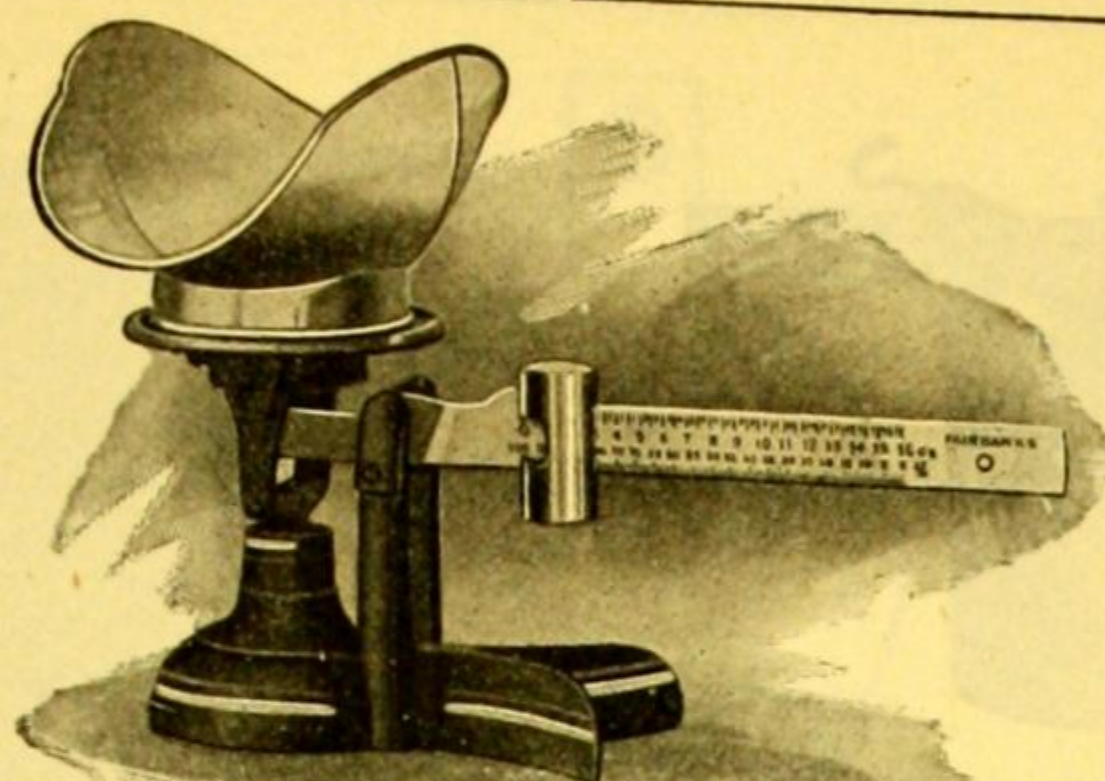
BALANCES, Grain Testing, see general heading Balances.

BALANCE WEIGHTS, see Balances.

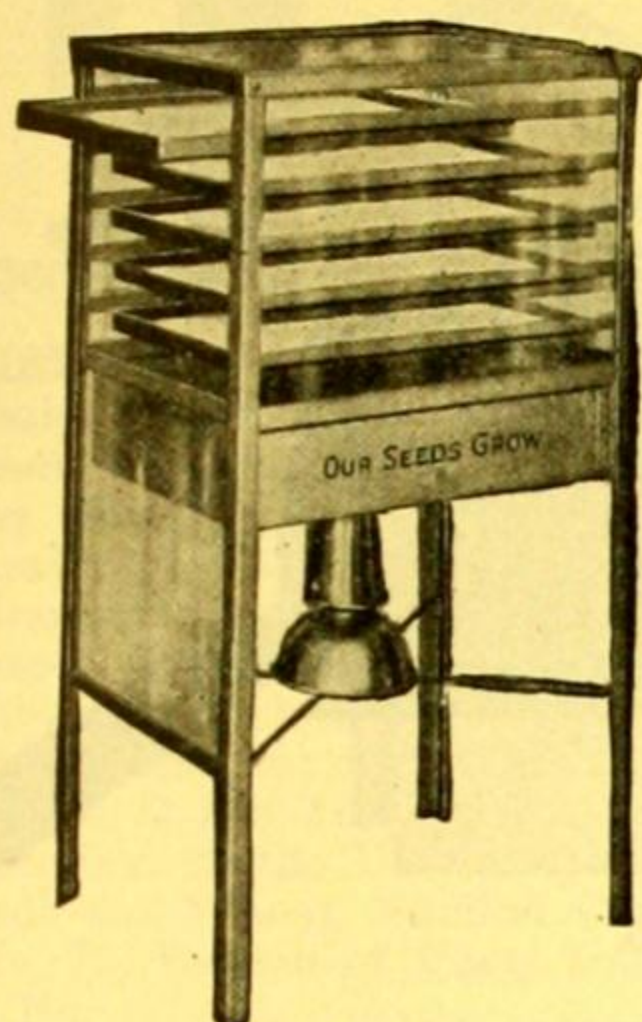
BOTTLES, Grain Sample, see Nos. 1756 and 1758.

FORCEPS for Seed and Grain analysis, see under general heading Forceps.

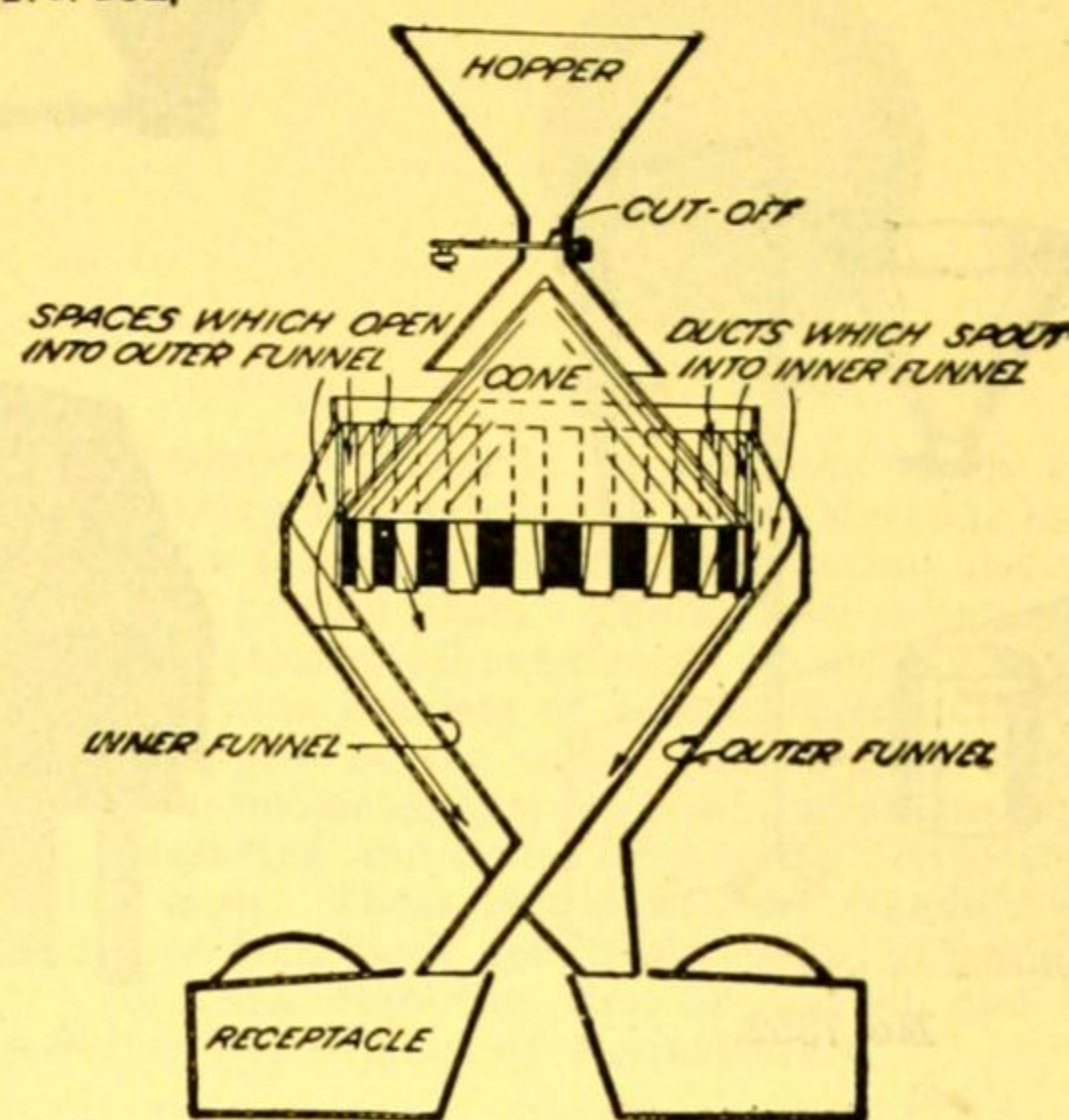
7310. **GERMINATING BOX** for showing proper depth to plant seeds. Of galvanized iron 15 inches long by 8 inches high, with glass front and back $\frac{3}{4}$ of an inch apart, making it easy to observe the germination of seeds planted at different depths. Complete with metal shields to exclude light from the sides. (See Farmer's Bulletin No. 218 of the United States Department of Agriculture.) 4.25
7312. **GERMINATING BOX, Ganong Pattern**, for sprouting and observing root growths. Light, rust-proofed metal box with inclined glass front. Dimensions, $7\frac{7}{8}$ inches long, 5 inches deep, $5\frac{3}{4}$ inches wide at the top, 4 inches wide at the bottom 1.70
7314. **GERMINATING PLATE**, of heavy glazed earthenware, 10 inches in diameter. For holding moist blotting paper in germination experiments. .40
7316. **GERMINATING PLATE**, of porous clay, $9\frac{3}{4}$ inches in diameter. Obviates the use of blotting paper in germination experiments. .25
3592. **GERMINATING PLATE**, of porous clay, $4\frac{1}{8}$ inches in diameter by $\frac{7}{16}$ inch deep, with straight sides 10% discount in lots of 12, 20% discount in lots of 144 .13
7320. **GERMINATING PLATE**, of graniteware, 11 inches in diameter by $1\frac{1}{4}$ inches deep. For use with moist blotting paper in germination experiments .40
7322. **GERMINATING TRAY**, of water-proofed wood, $25 \times 25 \times 2\frac{1}{4}$ inches deep, for testing fertility of corn and other grain. A frame which fits into the tray is divided into 144 squares which may be numbered if desired. 9.00
7324. **GERMINATING TRAY**, of wood, $18 \times 10 \times 2$ inches deep 2.50



No. 552.



No. 7336.



No. 7340.

7336. **GERMINATION TESTER, Sho-Gro**, oil heated, constructed throughout of non-rustable metal and glass. It has a capacity of 5 trays, each measuring 10x15 inches, so that a large number of samples may be accommodated at one time. The outside measurements over all are 32 inches high, 13 inches wide, and 17 inches deep. Since all sides are of glass, the progress of the test is always in view. Complete with 24 blotters, a supply of dividing strips and oil lamp for heating..... \$18.00
7338. **GERMINATION TESTER, Sho-Gro**, same as No. 7336, but electrically heated, with switch for three heats 25.00

In ordering, kindly state voltage of circuit.

GRAIN CONTAINER of galvanized iron, see Bins and Containers.

7340. **GRAIN SAMPLER, Boerner**, designed by the U. S. Department of Agriculture to enable laboratory workers to secure a reliable sample of grain or seed from a larger portion. The device consists of a hopper through which the grain falls upon the peak of a large cone. Spreading out upon the cone, half of the grain falls into the ducts at the base into the inner funnel and passes out through one spout; the remainder passes through the outside funnel surrounding the cone and is delivered through the other spout. By running either half through a second time, and repeating, samples of any size may be secured, each of which contains the same material as any other. For complete description and directions for use, see Bulletin No. 287 of the U. S. Department of Agriculture. Complete as described, constructed entirely of brass, with receptacles to catch the separated samples.

No.	A	B
Height over all, inches.....	31	17
Diameter over all, inches.....	15	10
Number of divisions.....	36	36
Each	45.00	35.00

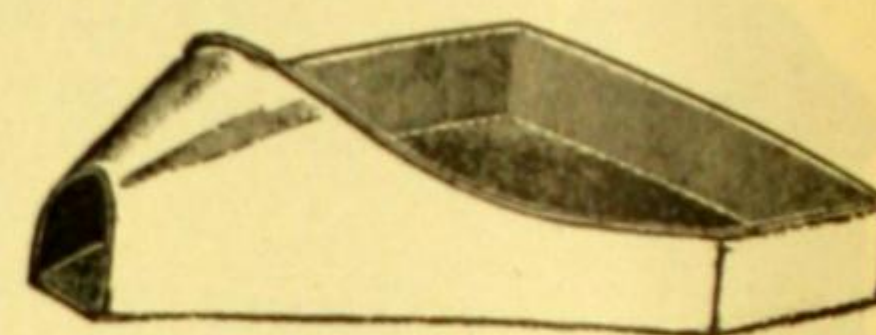
552. **GRAIN OR SEED SCALE (Dirt Scale)**, for ascertaining the percentage of dirt in grain or seed. The beam has two rows of marks, the upper indicating the weight, one pound by quarter ounces; the lower the percentage of dirt. In use a sample pound is weighed, sifted, and replaced in the scoop. The poise is then run back until the beam balances. The lower row of marks shows the percentage of loss by dirt removed, i. e., the percentage of dirt contained in the seed. Complete with brass scoop..... 12.00



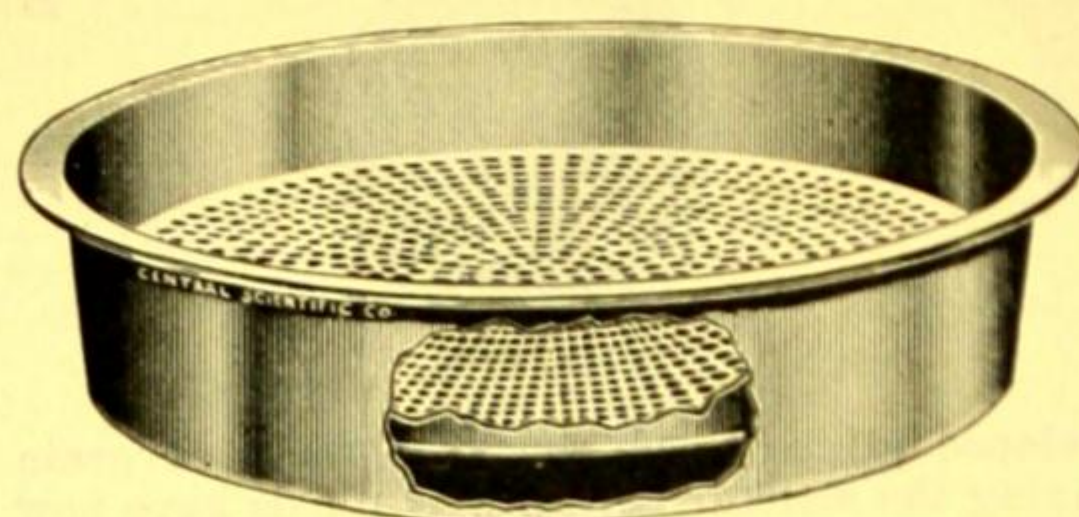
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No. 7384.



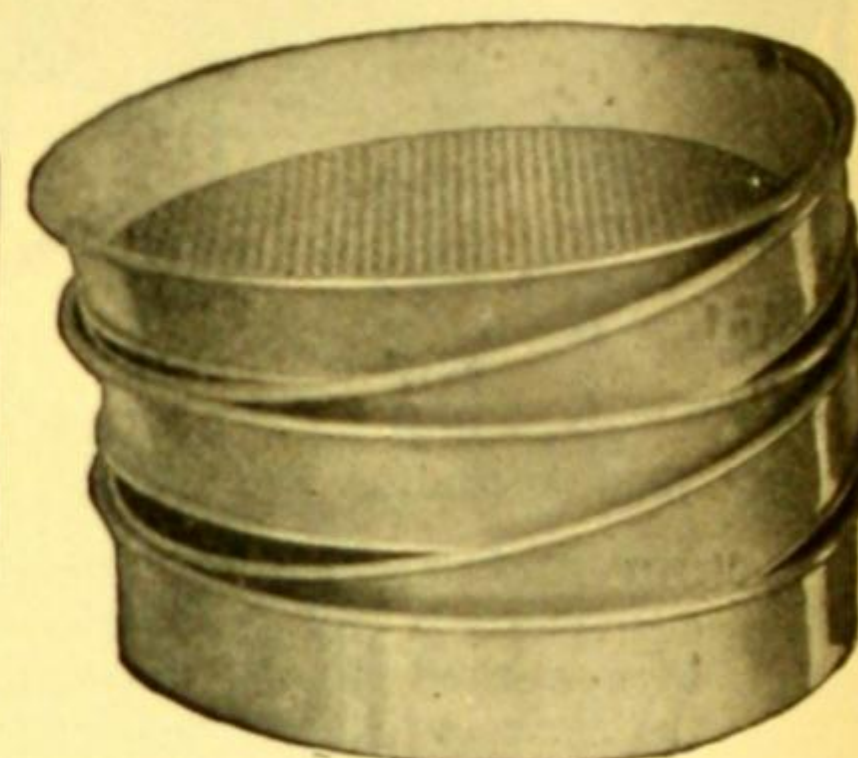
No. 7380.



No. 7398.



No. 5732.



No. 7402.

7380. **PAN, Sample**, of aluminum; for use in sampling and inspecting grains, with one end formed into a spout for pouring out contents. Strong, light, and well made; will not rust or tarnish; upward pitch of spout prevents grain from rolling out. Recommended in Bulletin No. 99 of the Bureau of Plant Industry. Size 9x6x1½ inches \$2.00

PROTEIN DETERMINATION APPARATUS FOR GRAIN, see general heading, Nitrogen Determination Apparatus.

7384. **SAMPLER, Bag**, similar to No. 7382, but for grains. Diameter, ¾ inch; length, 6 inches 1.50
7387. **SAMPLER, Grain**, consisting of two polished brass tubes, one fitted inside of the other and having openings matching each other. By turning the handle, the inner tube is revolved, thus opening and closing the holes. Length, 60 inches 11.00

7388. **SAMPLER, Grain**, same as No. 7387, but with 10 separate compartments making it possible to note unevenness in loading and also to ascertain the approximate location and quantity of any mixture of grain or of dirty, smutty, heating or damp spots..... 11.00

SAMPLE CANS, see under No. 1828.

SCOOPS, see under general heading Scoops.

For **SEED AND GRAIN SAMPLES AND TYPES**, send for Catalog of Agricultural Apparatus.

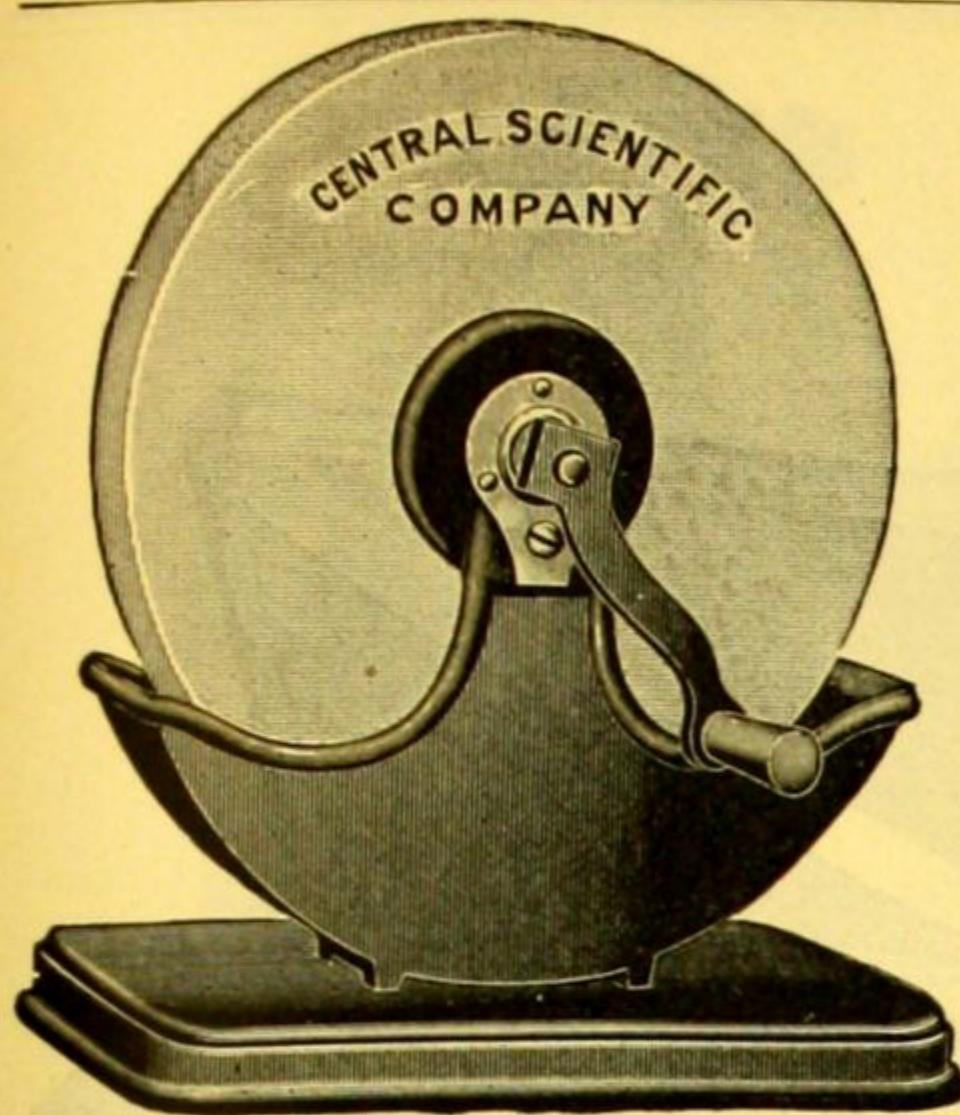
7398. **SIEVE, Corn Test**, of aluminum, according to specifications of the United States Department of Agriculture, consisting of one sieve with 12/64 inch round holes and one bottom pan, nested, 13 inches in diameter by 3 inches deep.....per set 4.00

7402. **SIEVES, Wheat Dockage**, according to Government specifications, consisting of a set of four sieves, 13 inches in diameter, with bottom pan, constructed of aluminum, telescoping. Consists of a buckwheat sieve with 8/64 inch triangular perforations; a fine seed sieve with 1/2 inch round perforations; a scalper sieve with 12/64 inch round perforations; and a course chess sieve with perforations 0.070 inch wide and 1/2 inch long. (See U. S. Department of Agriculture Handbook for 1920, "Official Grain Standards for Wheat, Shelled Corn and Oats.") Per set 8.00

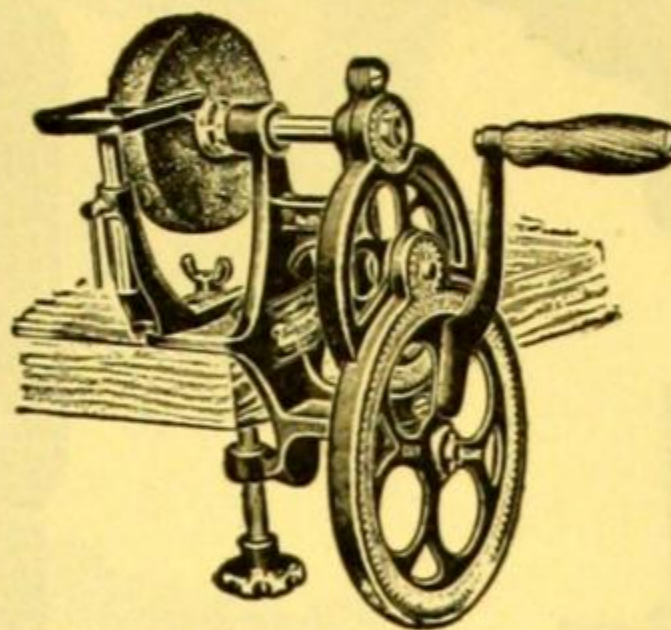
Note:—Fine chess sieve with perforations 0.064 inch wide and 3/8 inch long may be substituted for the course chess sieve if desired.

SPRINKLER, Rubber, for use with germinating apparatus, see No. 12756.

5732. **SULPHUR DETERMINATION APPARATUS**, for determining whether grain has been bleached, as recommended in Circular No. 111 of the United States Bureau of Plant Industry. Consists of an Erlenmeyer flask with ground in stopper and connecting tube. Capacity, 500 cc 1.50



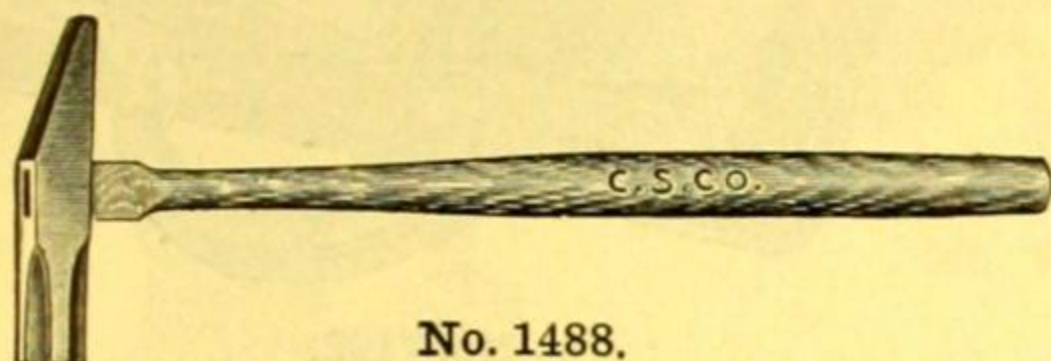
No. 7422.



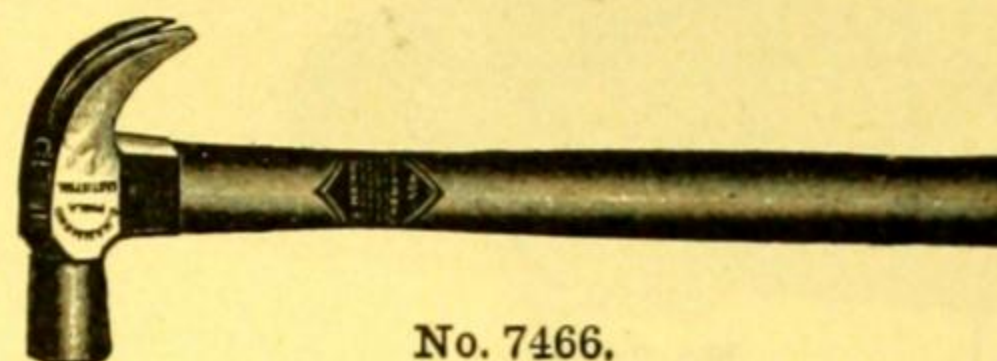
No. 7424.



No. 7460.



No. 1488.



No. 7466.



No. 7468.

7422. **GRINDSTONE**, Selected Berea, rubbed smooth, mounted in a cast iron trough, with pressed steel base, steel shaft and steel ball bearings. Shipped knocked down. Diameter, 6 in. \$4.00

7424. **GRINDER**, with clamp for fastening to table 2 inches thick or less. High quality abrasive wheel 4 inches in diameter, 1 inch face; gears enclosed for protection..... 9.00

HACK-SAWS, see **Saws**.

HAEMATOLOGY APPARATUS, see **Blood Testing Apparatus**.

7460. **HAMMERS**, of cast steel, wedge shaped, for breaking ores.

	A	B
No.	7	16
Weight, ounces	1.10	1.20
Each		

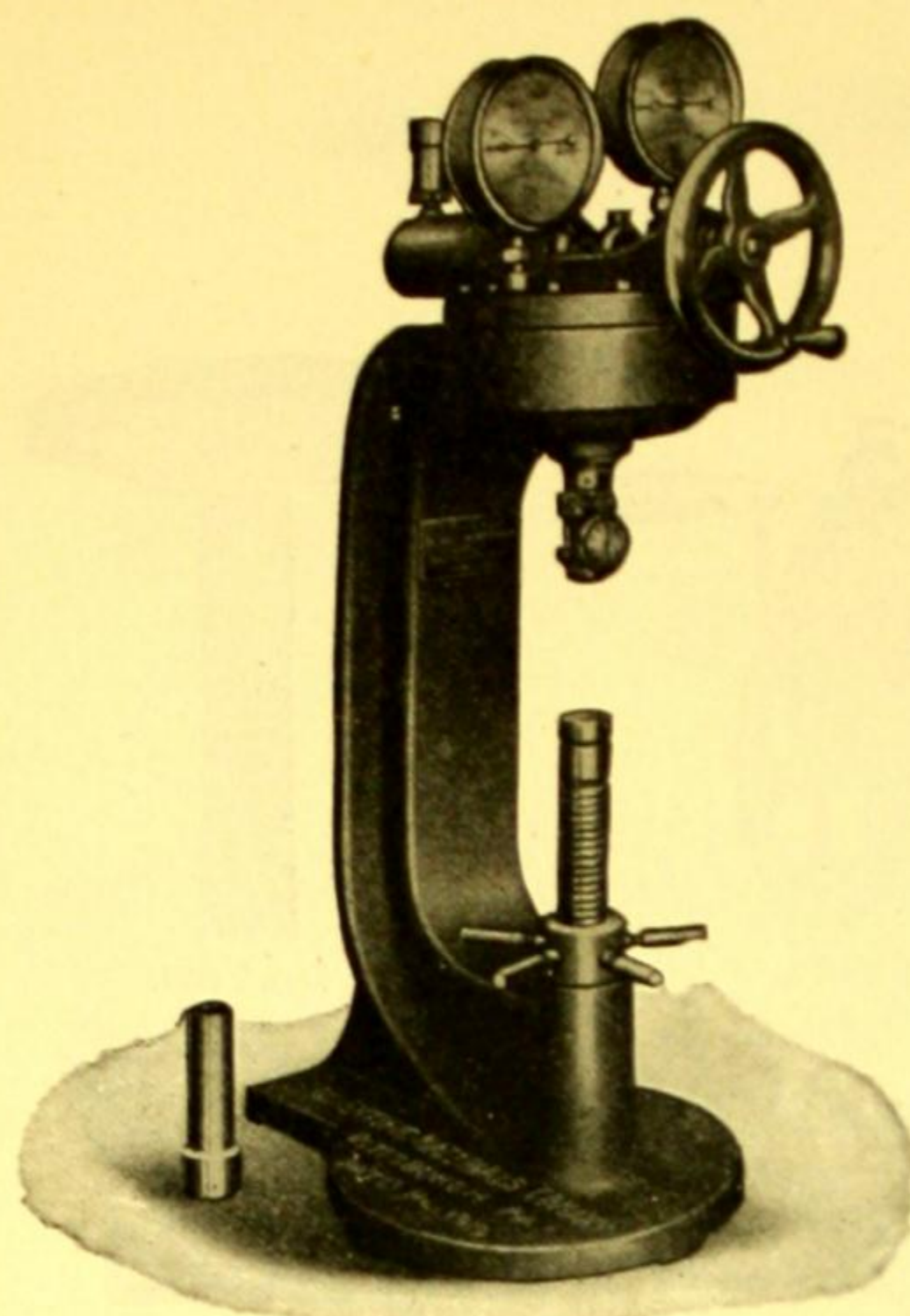
1488. **HAMMER**, Blowpipe, Plattner's, with wooden handle90

7466. **HAMMERS**, Claw, cast steel.

	A	B
No.	7½	13
Weight, ounces	1.10	1.20
Each		

7468. **HAMMER**, Prospecting Pick, of cast steel, square head with flat face. Pick point of hardened steel. Weight 1½ pounds..... 2.25

HAND TALLY, see **Counter No. 3319**.



No. 7484.



No. 7492.

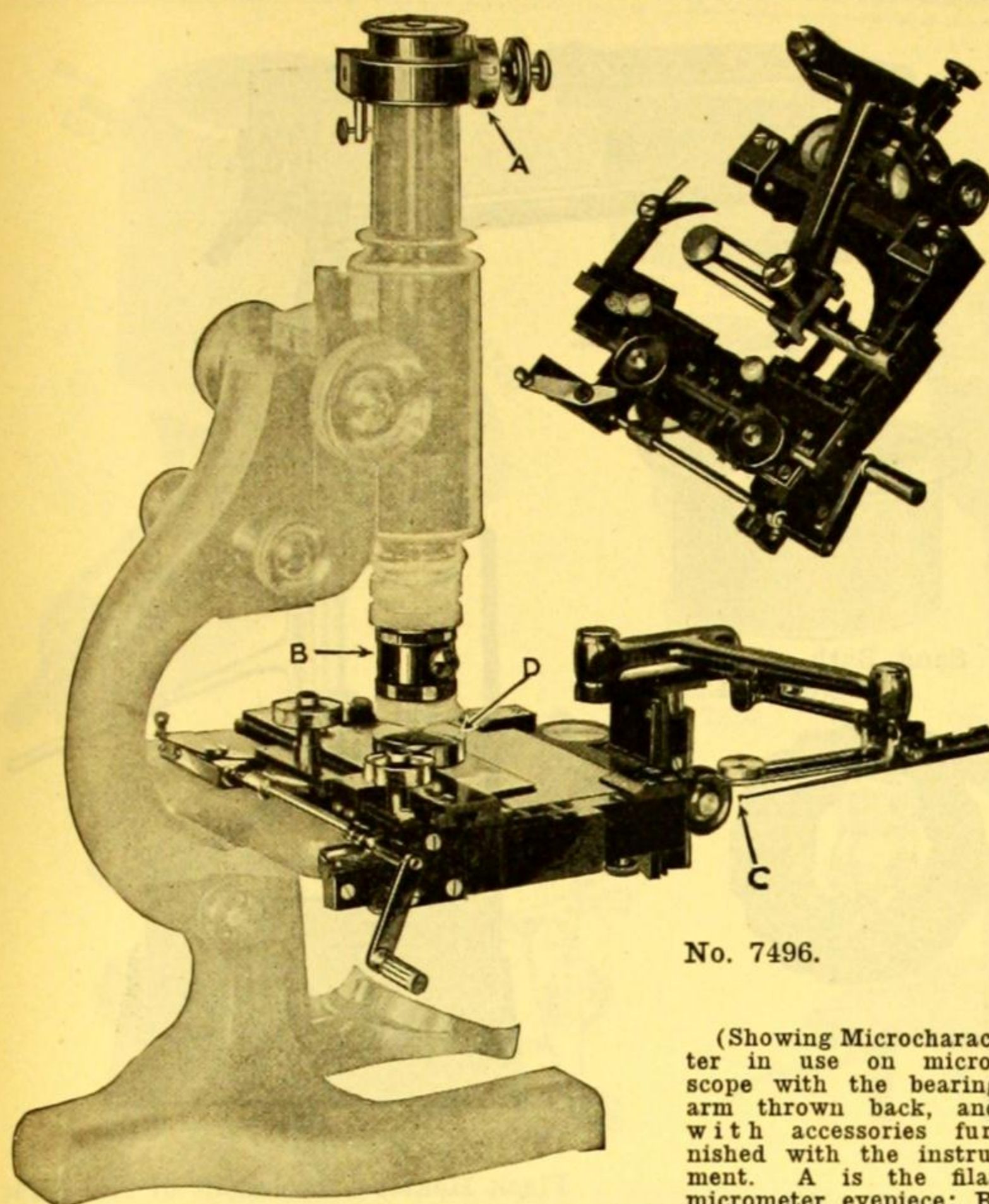
HARDNESS TESTERS

For a full discussion of methods of measuring hardness of metals, see Technologic Paper No. 11 of the United States Bureau of Standards.

7484. **HARDNESS TESTER, Brinell Ball Type**, for maximum pressure of 3,000 kilograms, for determining comparative hardness by the Brinell ball indentation method. This instrument is considered the standard for hardness tests and is widely used by steel manufacturers and users throughout the world. The machine is of the hydraulic type, using glycerine as the pressure medium. The press is so constructed that no air can leak in behind the plunger. A special feature of this method is the automatic depth gage by which the depth of the indentation may be read directly without calculation and the corresponding Brinell number obtained from a table supplied with each machine. Shipping weight, 700 pounds. Complete as described, filled with glycerine, with Automatic Depth Gage\$350.00
7492. **HARDNESS TESTER, Brinell Meter**, a portable instrument for determining the hardness of metals by comparing the diameters of the depressions produced in the test piece and a standard piece of known hardness, by a sphere under the influence of the same force. The advantages of such an instrument over other types are its portability, unlimited range of application, rugged construction and convenience in operation. Complete with one Brinell Meter, 12 standard 10mm balls, 6 standard bars of carefully determined Brinell hardness, 2 special scales for measuring the diameter of indentation, key for opening instrument and a set of direct-reading tables, with instructions for use, in leather covered carrying case, 9x6 inches; total carrying weight, 6½ pounds. (Unless specified, 3 bars of hardness 170 Brinell and 3 of 250 Brinell will be sent.) Descriptive booklet will be sent upon request..... 55.00
7493. **Standard Bars** for No. 7492.....each 1.00
(In ordering, specify degree of hardness desired, and give serial number of instrument with which they are to be used.)
7494. **Standard Steel Balls** for No. 7492, exactly 10 mm in diameter.....per dozen 1.50

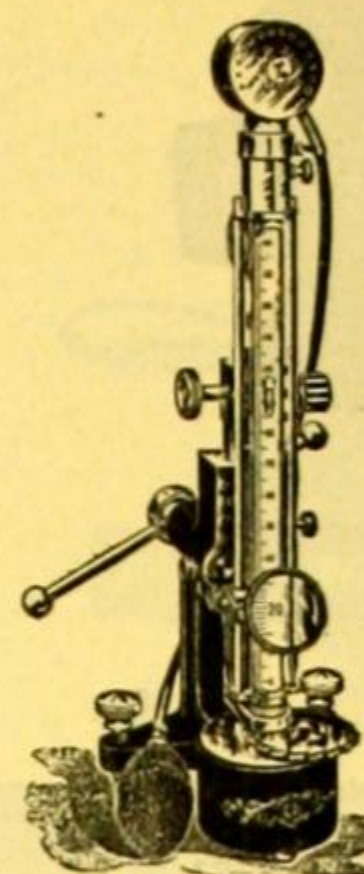


No. 7492

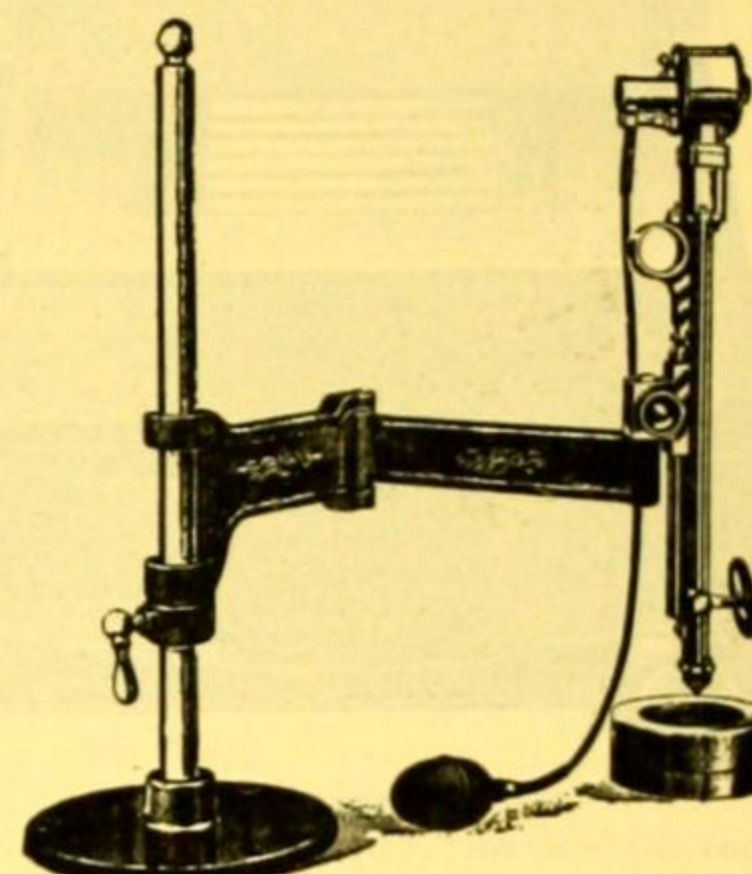


No. 7496.

(Showing Microcharactometer in use on microscope with the bearing arm thrown back, and with accessories furnished with the instrument. A is the filar micrometer eyepiece; B, the vertical illuminator, which is furnished with condensing and illuminating tube (see No. 8654); D is a polished specimen shown in position beneath the objective; C is the sapphire point. The illustration above and to the right shows the microcharactometer with the bearing arm in position for use.)



No. 7498.



No. 7498 (shown in use with swinging arm).

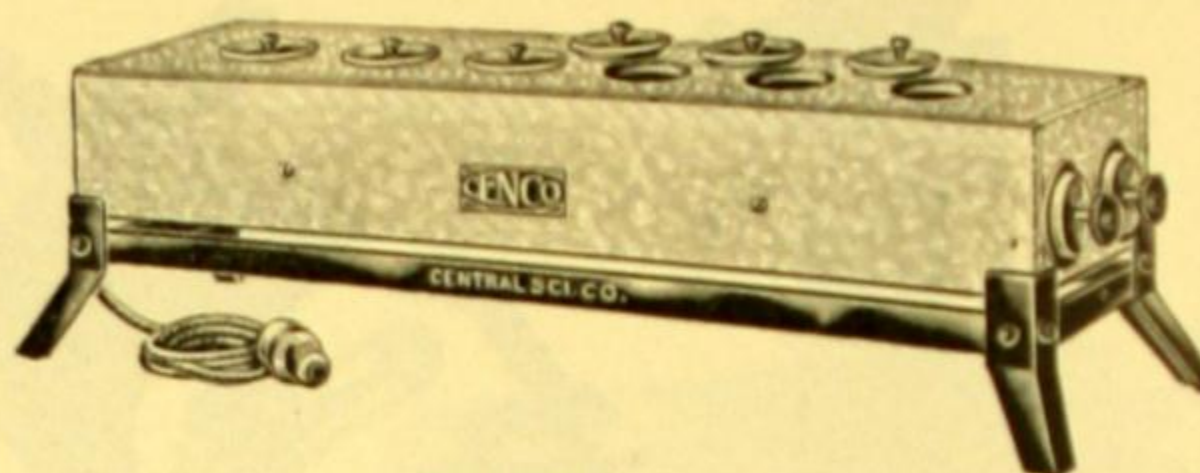
7496. **HARDNESS TESTER, Microcharactometer, Spencer**, as recommended by the American Society of Mechanical Engineers, for determining the relative hardness of individual grains of the crystalline structure of both ferrous and non-ferrous metals and alloys including hardened or soft steels of all kinds and non-ferrous bearing alloys. In connection with the metallographic analysis of a polished specimen for the proximate structural composition of the metal, the measurement of the relative hardness of the individual crystals of the micro-area may be accomplished with the microcharactometer. The instrument is similar in construction to a microscope mechanical stage and may be attached to any microscope having a rectangular stage. It consists of a sapphire point carefully cut to constitute the corner of a cube and accurately mounted so that the three facets make equal angles with the test surface, with one edge of the cube advancing in direct line of motion across the surface to be tested. By means of a small weight, found to be the lightest which would make a sufficient impression upon the hardest crystal, and at the same time produce a cut which could be measured, the jewel point is held with a constant pressure against the surface to be tested. By means of the micrometer feed of the microcharactometer, the surface to be tested is passed slowly and continuously beneath the jewel point. The scratch or cut thus made is examined under a microscope giving a magnification of about 900 diameters and its width carefully measured by means of a filar micrometer eyepiece. The hardness of the crystal may now be obtained in definite units from an arbitrary hardness scale which is a curve on which the readings of the degrees of hardness are plotted on the Y axis against the width of the cut in microns on the X axis.
- Complete in case with filar micrometer eyepiece No. 8634, vertical illuminator No. 8654, hardness scale and full directions for use..... \$250.00

7498. **HARDNESS TESTER, Scleroscope, Shore's**, for determining the comparative hardness of metals. The method consists in dropping a small hammer from a fixed height upon the piece being tested, and measuring the height of the rebound upon the scale, which reads directly in degrees of hardness. Complete with Scleroscope, platemount vessel, stand with swinging arm, magnifier, hammer for soft metals, one each for brass and hard steel, calibrated reference bars, and 50 blank curve charts in polished wood carrying case. Descriptive booklet sent upon request..... 225.00

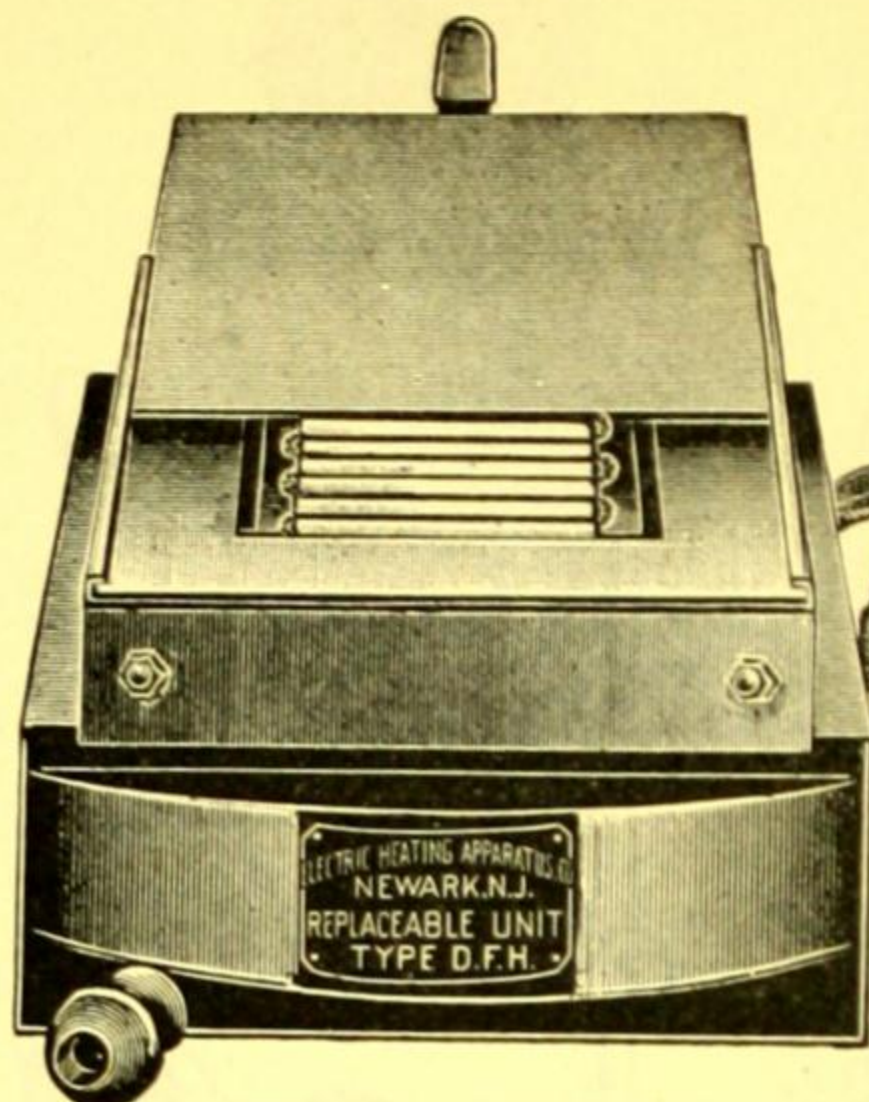
1508. **HARDNESS TESTING SCALE**, consisting of a set of nine minerals, without diamond.. 3.15



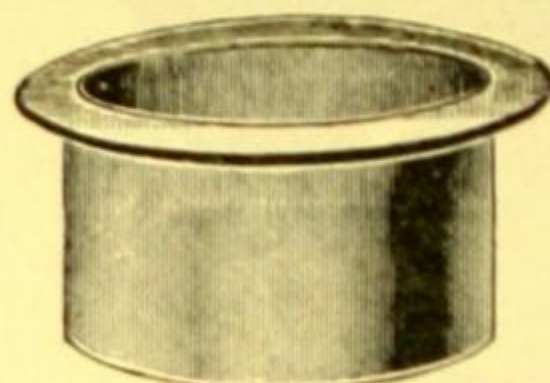
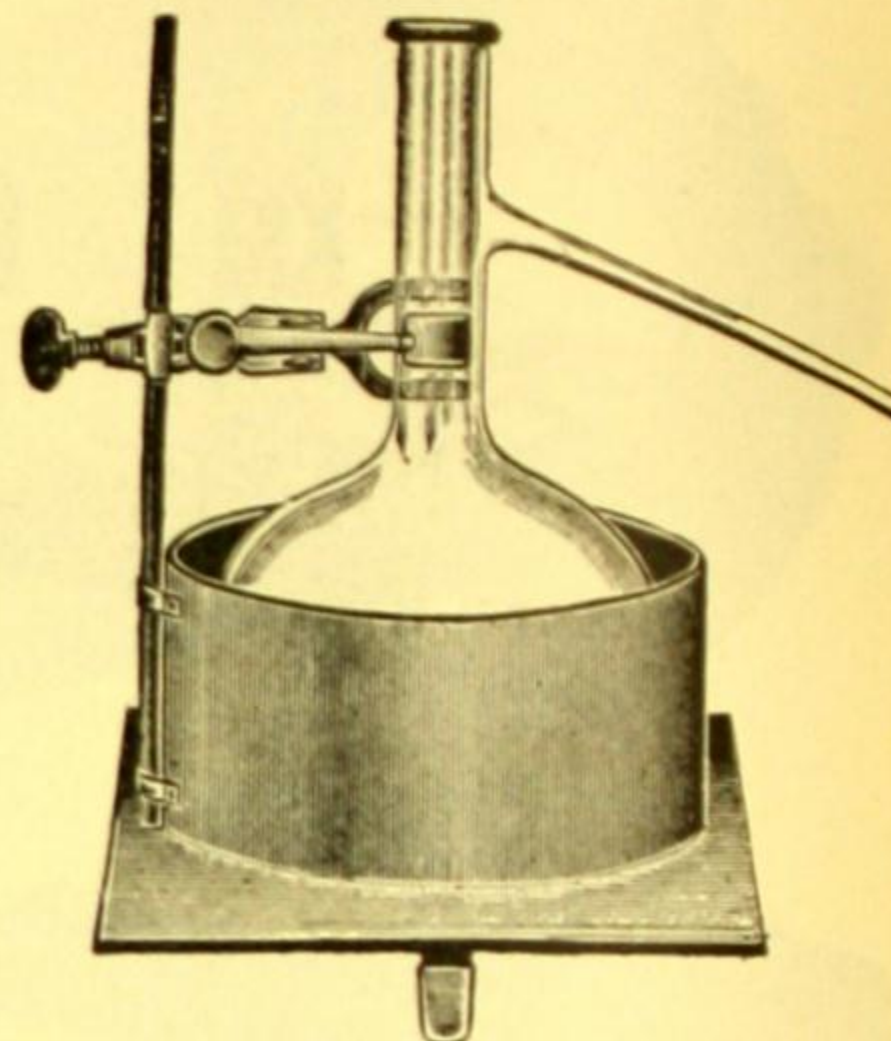
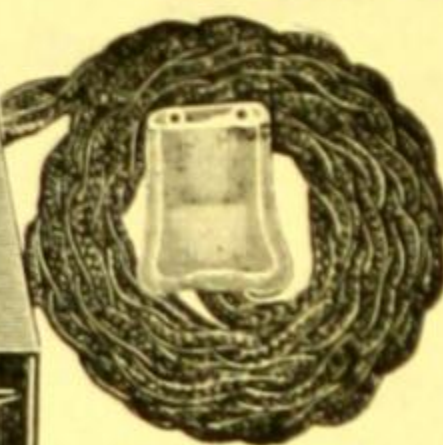
No. 7500.



No. 7512.



No. 7514.

Sand Bath attachment
of No. 7514.

Flask Heater attachment of No. 7514.

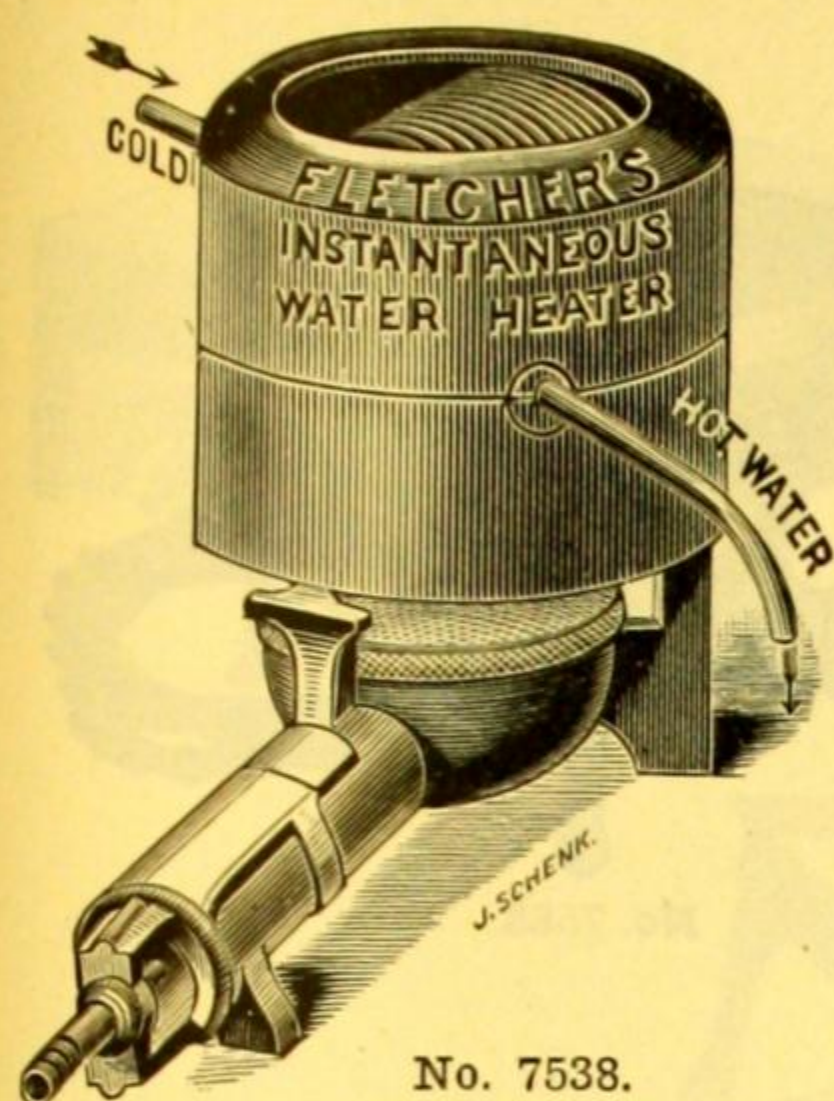
7500. **HATCHET**, high grade steel, black finish, polished face and bevel, selected white hickory handle, $3\frac{1}{2}$ inch bit..... \$1.00
HEAT GAGES, see Pyrometers.
HEATERS, Electric, for Extraction Apparatus, see Extraction Apparatus Heaters, Nos. 5260 and 5264.
7512. **HEATER**, Cenco Electric, suggested by W. H. Ross, consisting of a box of asbestos board (transite) 80x20x12 cm, across the bottom of which are placed longitudinally six heating coils of resistance wire. A galvanized iron shelf or pan, placed just above the heating coils, entirely closes off the heating chamber and prevents any possibility of ignition of inflammable vapors by the heating coils. The asbestos board top, which is removable, has six openings $2\frac{1}{2}$ inches in diameter with removable covers, for flasks. By means of two multiple-point snap switches, the six coils may be connected consecutively in the circuit as desired and varying degrees of heat obtained. By removing the top, the flasks may be placed directly on the pan which may be used either dry as a hot plate or, filled with water, as a water bath. By supporting the flasks above the openings in the top, the instrument becomes a hot-air bath.

Specifications

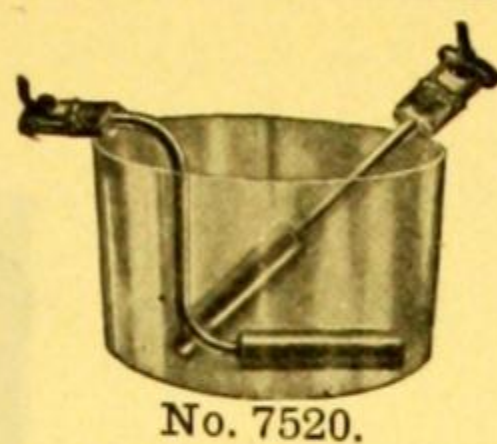
Length over all, including legs, inches.....	34
Height to top of box, inches.....	9
Diameter of holes, inches.....	$2\frac{1}{2}$
Power consumption, maximum, watts.....	800

Complete as described with receptacle, five feet of connecting cord and separable plug for attachment to any lamp socket.

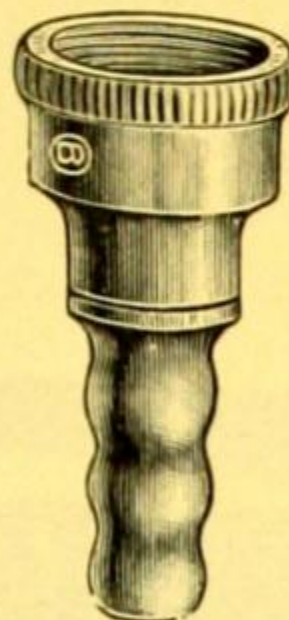
No.	For volts	A	B
Each	Each	110	220
7514.	HEATERS, Electric Combination Flask, Sand Bath, and Hot Plate. Constructed with replaceable unit, and with housing of heavy sheet steel containing rheostat for temperature control. Upper part of casing is flanged to form slide for several appliances. Maximum temperature obtainable, 540°C. (1000°F.), which can be controlled sufficiently low for ether extractions. Complete with Hot Plate Slide, 8x9 inches; Flask Heater Attachment, 6x3 $\frac{3}{4}$ inches; two Sand Bath Attachments, 4 and 6 inches by 3 $\frac{3}{4}$ inches deep; and with connecting cord and plug. No.	60.00	60.00
	For volts.....	A	B
	Each	110	220
7515.	Extra Heating Units for No. 7514.....	42.50	42.50
		4.00	4.00



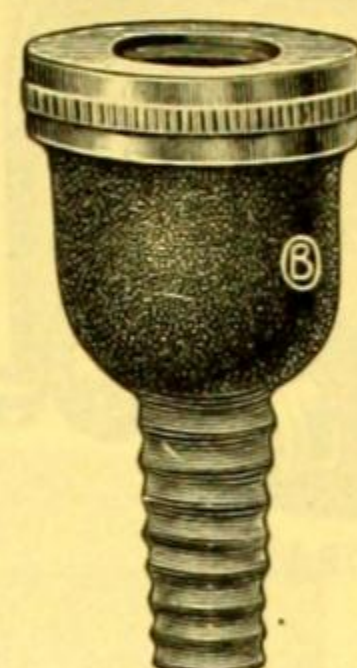
No. 7538.



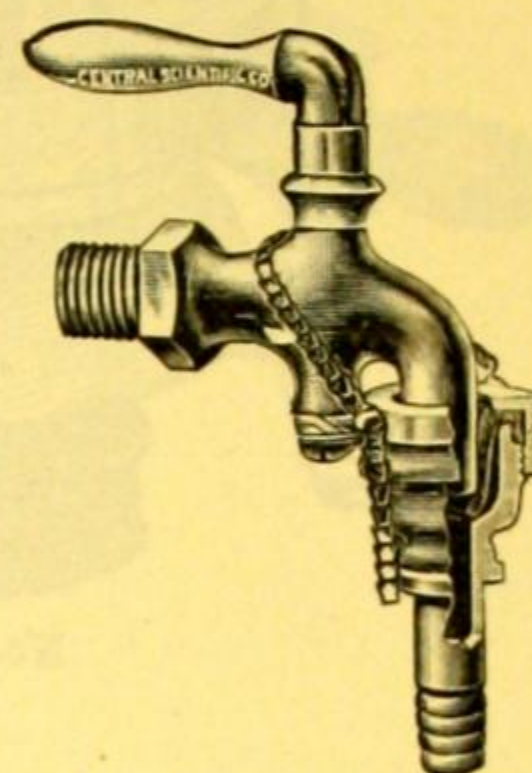
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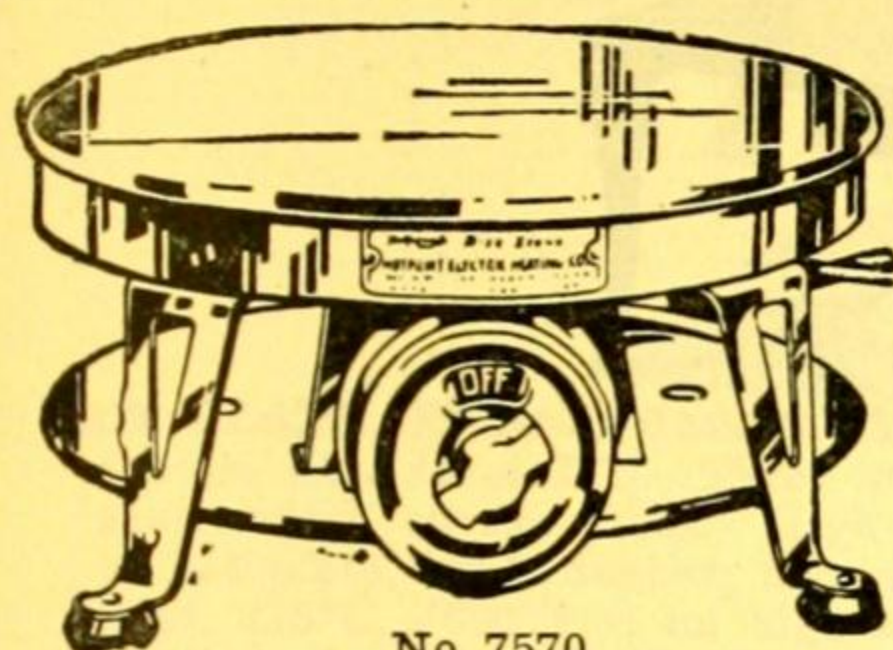
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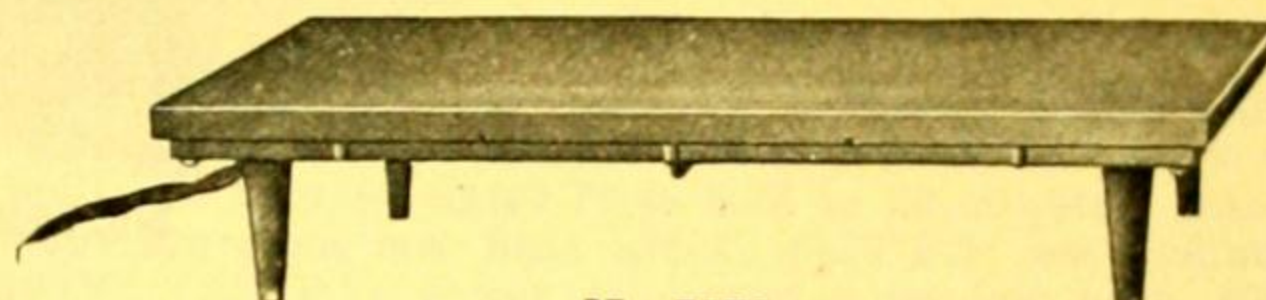
No. 7558A.



No. 7562 (in use).



No. 7570.



No. 7572.

7520. **HEATERS, Electric Immersion, Cylindrical form**, made of copper and brass, nickel-plated. Diameter of cylinder, $\frac{3}{4}$ inch; length of heater, 7 inches; weight, $\frac{3}{4}$ pound; power consumption, 350 watts. Complete with connecting cord, attachment plug and special switch-plug. No. A B
For volts..... 110 220
Each \$5.25 5.75

HEATERS, Flask, sheet iron, see **Flask Heaters**.

7538. **HEATER, Instantaneous Water**. Gives hot water in three seconds after the gas is lighted, and in one minute will give sufficient hot water for washing hands. Total height, 9 inches; gas supply required, $\frac{3}{8}$ inch clear bore pipe and tap; maximum gas consumption 60 cubic feet per hour. Heater complete with burner, as illustrated 10.25

HONES, see **Microtome Accessories**.

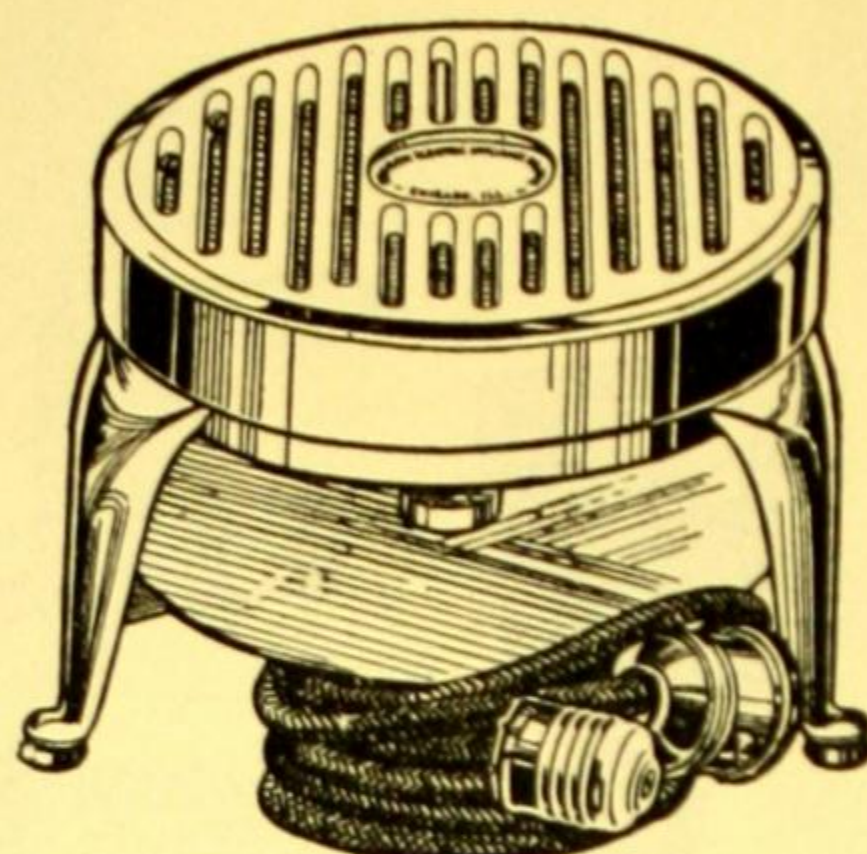
HOSE, Rubber, see **Rubber Tubing**.

7556. **HOSE CONNECTOR**, brass, for rubber tubing, with thread for ordinary hydrant or kitchen bib70
7558A. **HOSE CONNECTOR**, brass, for smooth faucets. For $\frac{1}{2}$ inch faucet..... .60
7560A. **HOSE CONNECTOR**, brass, same as No. 7558. For $\frac{3}{8}$ inch faucet..... .60
7562. **HOSE CONNECTOR, Universal**, not threaded, but merely slipped on a faucet and fastened with a chain. Can be quickly attached to any water faucet. The simplest device for attaching filter pumps, stills, water motors, turbines and centrifuges to a common faucet. It is practical, self-tightening and air tight..... 1.20
7570. **HOT PLATES, Electric, round form**, three heat, with cast iron top and pressed steel base, with regulating switch. Furnished with six feet of cord and lamp socket plug. May be used on either alternating or direct current circuits. C size requires special wiring.
No. B C
Diameter, inches 6 8
Power consumption, minimum watts..... 150 237
Power consumption, maximum watts..... 600 950
Each 9.25 15.00

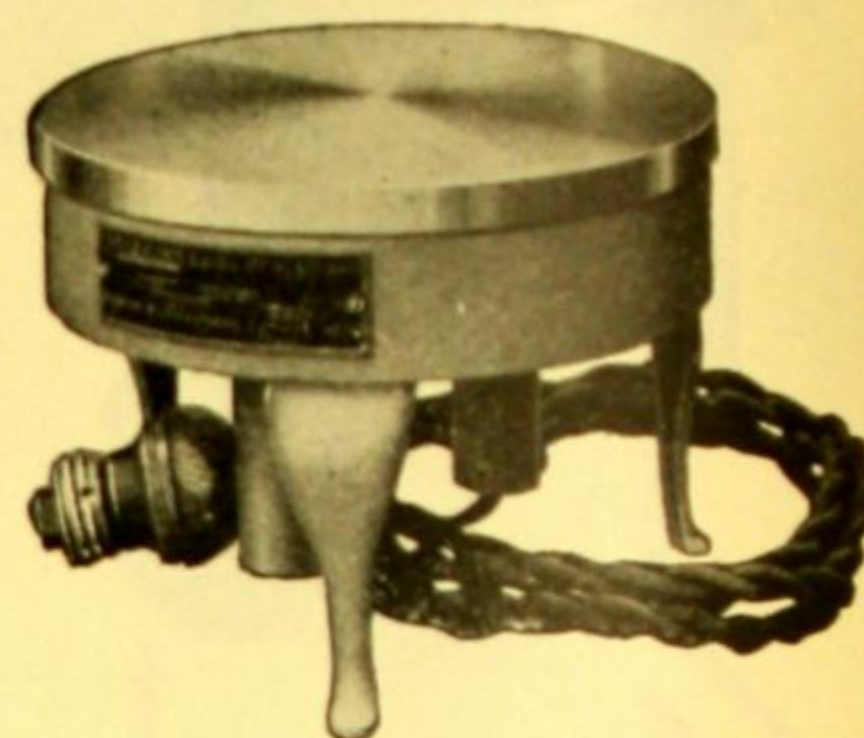
In ordering kindly state voltage.

7572. **HOT PLATES, Electric, rectangular form**, three heat, with 4 feet of cord but without lamp socket plug. With three plug switches to control heat.
No. A B
Size, inches 9x12 12x18
Power consumption, minimum watts..... 300 550
Power consumption, maximum watts..... 880 1550
Each 35.00 60.00

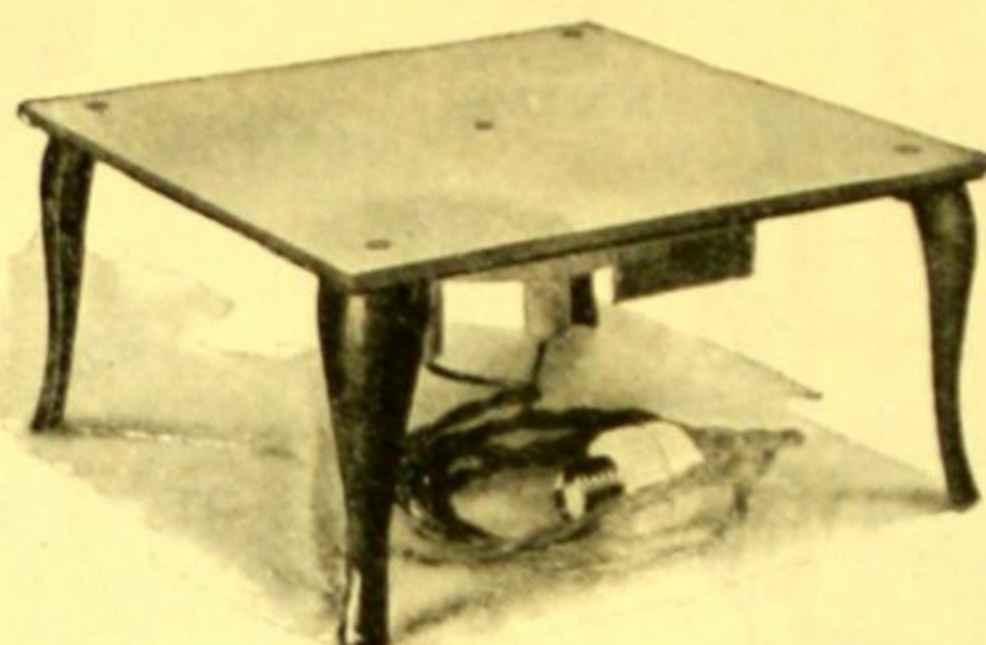
In ordering kindly state voltage.



No. 7578A.



No. 7588.



No. 7592.

7578A. **HOT PLATE, Electric, Grid Type**, three heat, with heating surface $6\frac{1}{2}$ inches in diameter; height of plate, 5 inches. A greater amount of heat may be obtained from this plate than from other forms, as the heating unit is in the open and direct radiation is obtained. Provided with a switch in the cord giving three heats, consuming 165, 330 and 660 watts; finished in nickel-plate. Shipping weight, 17 pounds. Complete with 7 feet of connecting cord and attachment plug, for 110 volt circuit..... \$11.50

7579A. **Extra Heating Units for No. 7578**.....each 4.75

7588. **HOT PLATE, Electric, Hoskins Type MA-101**, for use on either A.C. or D.C., with replaceable heating element of Chromel wire guaranteed to last one year. With top and legs of heavy cast aluminum, and with replaceable spiral resistance unit. Heat distribution uniform over top. Very useful for evaporating solutions, drying precipitates, etc. Boils 500 cc of water from cold in 15 minutes. Diameter, 6 inches; power consumption, 500 watts; maximum temperature, 483°C . or 900°F . Complete with 6 feet of flexible cord and separable attachment plug.

No.	A	B
For volts	110	220
Each	10.00	10.00

7590. **Extra Heating Units for No. 7588**.

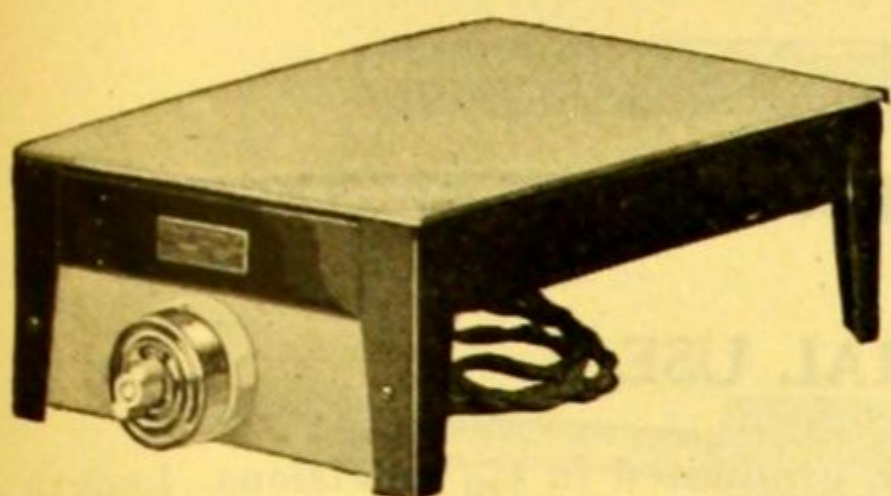
No.	A	B
Each	3.50	3.50

7592. **HOT PLATES, Electric, Hoskins Type MA-111**, for use on either A.C. or D.C., with replaceable unit. Size of plate, 12x12 inches. Requires only 5 amperes at 110 volts and $2\frac{1}{2}$ amperes at 220 volts. Heated by spiral resistance unit at center, covering area $5\frac{3}{4}$ inches in diameter. Will boil 500 cc of water placed in the center from cold in 1 hour and 15 minutes. The cooler section around the center is useful for slowly evaporating to dryness contents of beakers, etc. Maximum temperature at center, 338°C . (640°F .); at edge, 121°C . (250°F .); power consumption, 500 watts. Complete with 6 feet of twin-conductor flexible cord with detachable connector plug.

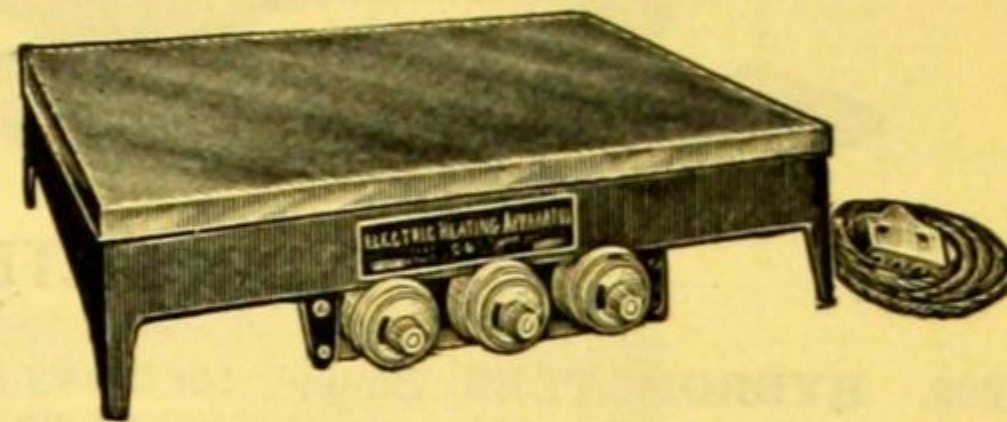
No.	A	B
For volts	110	220
Each	12.00	12.00

7593. **Extra Heating Units for No. 7592**.....each 3.50 3.50

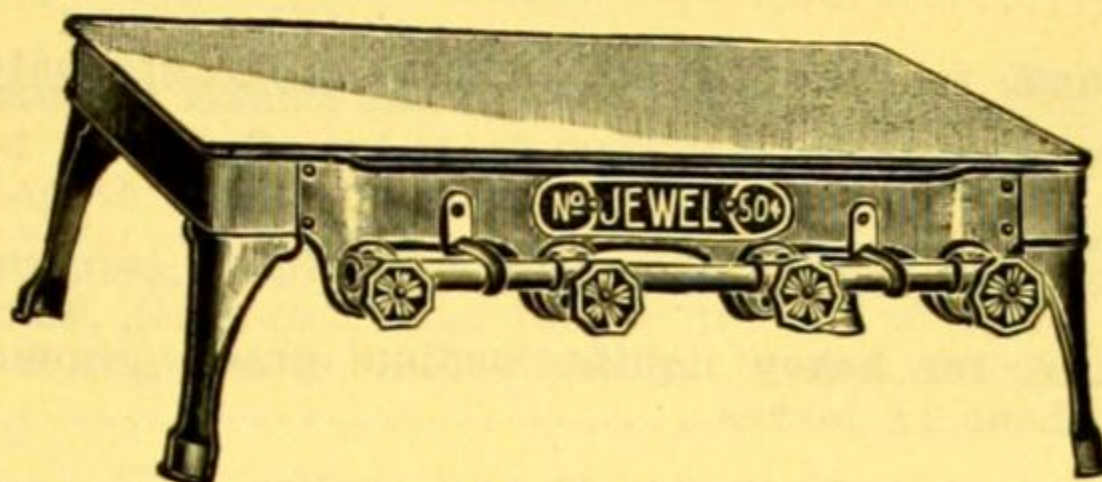
Note:—A snap or knife switch of the proper capacity should be used in the line for opening and closing the circuit to Electric Hot Plates Nos. 7578A-7592.



No. 7596.



No. 7602.



No. 7610.

7596. **HOT PLATE, Electric, Hoskins Three Heat**, for variable temperatures, with replaceable unit for use on A.C. or D.C. Three heats are obtainable from parallel windings, controlled by a snap switch on the front. High heat boils one liter of water from cold in 20 minutes. Size of hot plate, 12x18 inches; maximum temperature on low heat 246°C. (475°F.); on medium heat, 315°C. (600°F.); on high heat, 400°C. (750°F.); power consumption on low heat, 600 watts; on medium heat, 1200 watts; on high heat, 1800 watts. Mounted on four square steel legs with aluminum finished steel top, complete with 6 feet twin-conductor flexible cord and detachable connector plug.

No.	A	B
For volts	110	220
Each	\$50.00	50.00

7597. **Extra Heating Units for No. 7596**.....each 12.00 12.00

7602. **HOT PLATES, Electric, Multiple Unit Three Heat Type**, with replaceable units. Can be used interchangeably on 110 and 220 volts, either A.C. or D.C. The method of construction forces heat to the top, providing a higher temperature than is usually attained with hot plates without increased current consumption. By shifting connections at the rear from the 110 volt to the 220 volt pins, the number of heats obtained on 110 volts is doubled. All sizes give a maximum temperature of approximately 750°F. (400°C.); on medium heat, 600°F. (315°C.); on low heat, 400°F. (205°C.) Made of cast iron with removable cast iron tops. Bases are finished in optical black. No. 44 is especially suitable for extraction work.

No.	12	22	32	44
Size, inches	12 $\frac{1}{4}$ x12 $\frac{1}{4}$	18x12 $\frac{1}{4}$	24x18	4 $\frac{1}{2}$ x24
Shipping weights, pounds.....	45	74	127	40
Power consumption on low heat, watts.....	352	520	1025	200
Power consumption on med. heat, watts.....	704	1030	2050	400
Power consumption on high heat, watts.....	1056	1550	3080	600
Each	37.50	55.00	80.00	32.50

7603. **Extra Heating Units for No. 7602**.

Number required.....	2	2	2	2
Each	5.00	6.00	6.00	4.00

Note:—A double-pole knife switch of the proper capacity should be used to open and close the circuit to Hot Plates Nos. 7596-7602.

7610. **HOT PLATES or Drying Tables**, for use with gas. The top is of one piece of steel, with polished surface; the legs and frame are of cast iron. Flame easily regulated. Gives an even temperature.

No.	A	B
Size of plates, inches.....	10x18 $\frac{1}{2}$	14 $\frac{1}{2}$ x18 $\frac{1}{2}$
Number of burners.....	1	2
Each	12 00	18.00

HYDROMETERS



HYDROMETERS FOR GENERAL USE

7622. **HYDROMETERS, Baumé, for heavy liquids, highest quality, graduated in $\frac{1}{10}^{\circ}$ divisions. Length, about 11 inches. Graduated at 60°F.**

No.	A	B	C	D	E	F	G
Range, degrees Baumé.....	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Each	\$1.50	1.50	1.50	1.50	1.50	1.50	1.50

7626. **HYDROMETERS, Baumé, for heavy liquids, highest quality, graduated in $\frac{1}{2}^{\circ}$ divisions. Length, about 11 inches.**

No.	A	B
Range, degrees Baumé.....	0-35	35-70
Each	1.25	1.25

7628. **HYDROMETER, Baumé, for heavy liquids, medium grade, graduated from 0° to 70° in 1° divisions. Length, about 11 inches.** .60

7632. **HYDROMETERS, Baumé, for light liquids, highest quality, graduated in $\frac{1}{10}^{\circ}$ divisions. Length, about 11 inches. Graduated at 60°F.**

No.	A	B	C	D	E	F	G	H
Range, degrees Baumé....	90-80	80-70	70-60	60-50	50-40	40-30	30-20	20-10
Each	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60

7636. **HYDROMETER, Baumé, for light liquids, medium grade, graduated from 100° to 10° in 1° divisions. Length, about 11 inches.** .60

7638. **HYDROMETERS, Specific Gravity Scale, Precision Grade, for scientific work requiring highest degree of accuracy. Graduated at 60° F., in 0.001 divisions. Length, about 15 inches.**

No.	Range	Each	No.	Range	Each
A	.700 to .760	\$3.00	K	1.300 to 1.360	3.00
B	.760 to .820	3.00	L	1.360 to 1.420	3.00
C	.820 to .880	3.00	M	1.420 to 1.480	3.00
D	.880 to .940	3.00	N	1.480 to 1.540	3.00
E	.940 to 1.000	3.00	O	1.540 to 1.600	3.00
F	1.000 to 1.060	3.00	P	1.600 to 1.660	3.00
G	1.060 to 1.120	3.00	Q	1.660 to 1.720	3.00
H	1.120 to 1.180	3.00	R	1.720 to 1.780	3.00
I	1.180 to 1.240	3.00	S	1.780 to 1.850	3.00
J	1.240 to 1.300	3.00	T	1.850 to 1.950	3.00

7639. **HYDROMETERS, Specific Gravity Scale, Precision Grade, consisting of the twenty spindles listed under No. 7638 together with two selection spindles by means of which one may determine quickly which single spindle to use. The selection spindles are graduated from 0.700 to 1.000 and 1.000 to 1.950 respectively and have enclosed thermometers for temperature readings. Complete as described in plush-lined case** .75.00

7644. **HYDROMETERS, Specific Gravity Scale, for heavy liquids, medium grade, graduated in 0.002 divisions. Length, about 11 inches.**

No.	A	B	C	D	E
Range, gravity.....	1.000-1.200	1.200-1.400	1.400-1.600	1.600-1.800	1.800-2.000
Each	.75	.75	.75	.75	.75

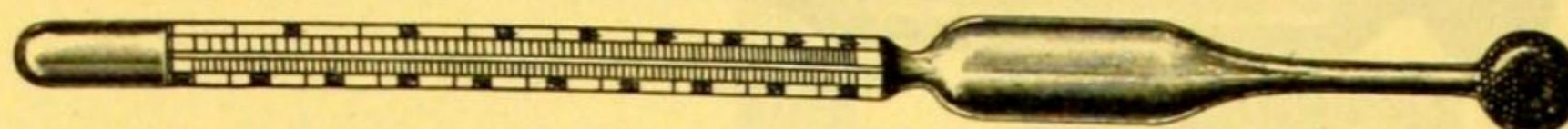
7646. **HYDROMETER, Specific Gravity Scale, for heavy liquids, medium grade, graduated from 1.000 to 2.000 in 0.01 divisions. Length, about 11 inches** .60

7652. **HYDROMETERS, Specific Gravity Scale, for light liquids, medium grade, graduated in 0.002 divisions. Length, about 11 inches.**

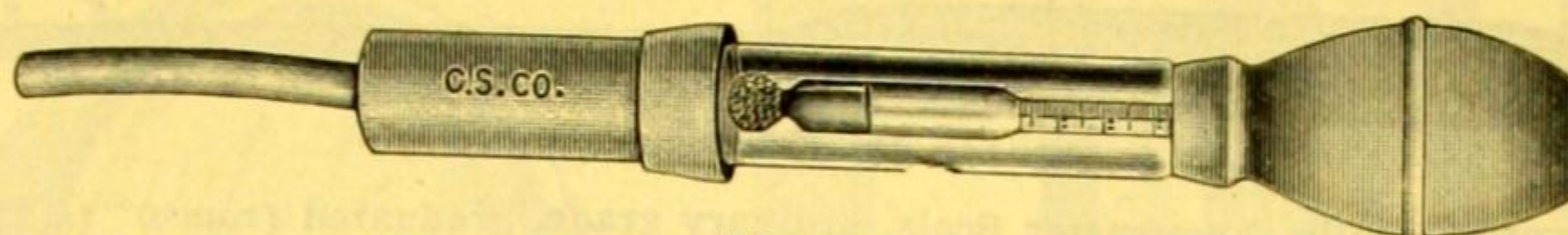
No.	A	B	C	D
Range, gravity.....	0.600-0.700	0.700-0.800	0.800-0.900	0.900-1.000
Each	.75	.75	.75	.75

7654. **HYDROMETER, Specific Gravity Scale, for light liquids, medium grade, graduated from 0.700-1.000 in 0.005 divisions. Length, about 11 inches** .75

7658. **HYDROMETER, Combined Baumé and Specific Gravity Scales, for heavy liquids, ordinary grade, graduated from 0° to 70° Baumé in 1° divisions, and from 1.000 to 2.000 specific gravity in 0.01 divisions. Length, about 11 inches.** .75



No. 7660.



No. 7698.

7660. **HYDROMETER, Combined Baumé and Specific Gravity Scales, for light liquids, ordinary grade,** graduated from 100° to 10° Baumé in 1° divisions, and from 0.600 to 1.000 specific gravity in 0.005 divisions. Length, about 11 inches. \$0.70
7664. **HYDROMETER, Universal, Combined Baumé and Specific Gravity Scales for light and heavy liquids, medium grade,** graduated from 100° to 10° and 0° to 70° Baumé in 1° divisions; from 0.600 to 1.000 in 0.01 divisions, and 1.000 to 2.000 in 0.01 divisions. Length, about 16 inches 1.20

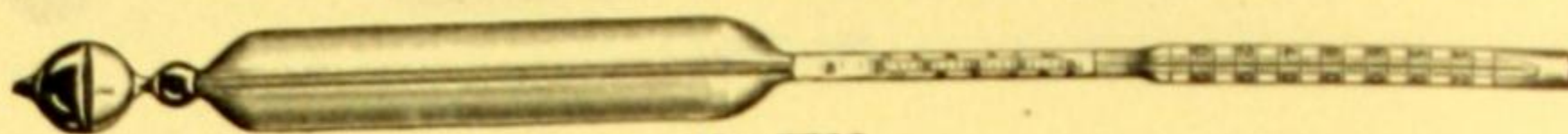
HYDROMETERS FOR SPECIAL USES

HYDROMETERS, Acid, see Hydrometers, Baumé.

7670. **HYDROMETER, Acid, Specific Gravity Scale, medium grade, for use in Babcock milk test.** Graduated from 1.800 to 1.850 in 0.001 divisions. Length, 6 inches.70
7674. **HYDROMETERS, Alcohol or Spirit, United States Internal Revenue, Per Cent. of Proof Scale, highest quality.** Length, about 8¾ inches.
- | No. | A | B | C | D | E |
|---------------------------------|-------|--------|---------|---------|---------|
| Range, degrees | 0-100 | 80-120 | 100-140 | 130-170 | 160-200 |
| Graduated in, degrees | 1 | ½ | ½ | ½ | ½ |
| Each | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
7678. **HYDROMETER, Alcohol, Proof and Tralle Scales, medium grade,** graduated from 100° below to 100° above Proof, and from 0° to 100° Tralle in 1° divisions. Length, about 11 in.70
7680. **HYDROMETER, Alcohol, United States Custom House, Proof and Tralle Scales, medium grade, with enclosed thermometer.** Graduations same as No. 7678. Length, about 18 inches. With correction scale. 3.50
7684. **HYDROMETER, Alkali, Baumé Scale, medium grade,** graduated from 0° to 60° in 1° divisions. Length, about 11 inches.70
7686. **HYDROMETER, Ammonia or other light liquids, Baumé Scale, medium grade,** graduated from 10° to 50° in ½° divisions. Length, about 11 inches.70
7692. **HYDROMETER, Barkometer Scale, for tanning liquids, medium grade,** graduated from 0° to 65° (1.000 to 1.065 specific gravity) in 1° divisions. Length, about 11 inches.60
7698. **HYDROMETER, Battery Syringe or Chargometer, Specific Gravity Scale, ordinary grade,** graduated from 1.1 to 1.3 in 0.005 divisions. Length of hydrometer, 3½ inches; length over all, 12 inches. Complete with good quality rubber bulb and glass syringe with unbreakable flexible rubber tip75
- HYDROMETER, Benzine, see Hydrometers, Oil Testing.**
7704. **HYDROMETER, Calcium Chloride Salometer, highest quality, for specific gravity of brine.** Graduated from 0° to 120° in 1° divisions. Length, about 11 inches. 1.50
- 7652B. **HYDROMETER, Ether, Specific Gravity Scale, highest quality,** graduated from 0.700 to 0.800 in 0.002 divisions. Length, about 11 inches.75
- HYDROMETER, Gasoline, see Hydrometers, Oil Testing.**
7720. **HYDROMETER, Glue, Baumé Scale, highest quality,** graduated from 0° to 35° in ½° divisions, for use at 150°F. Length, about 11 inches 1.25
7724. **HYDROMETER, Lime Sulphur (Li-Sul-Sprayometer), Baumé and Specific Gravity Scales, medium grade, New York and Pennsylvania pattern, for testing lime-sulphur wash used in spraying.** Graduated from 0° to 38° Baumé, in ½° divisions, and from 1.000 to 1.350 specific gravity, in 0.005 divisions.75
7726. **HYDROMETER, Lime Sulphur, same as No. 7724, complete with 12x2-inch glass jar in cardboard case with directions for use.** 1.40



No. 7730.



No. 7732.

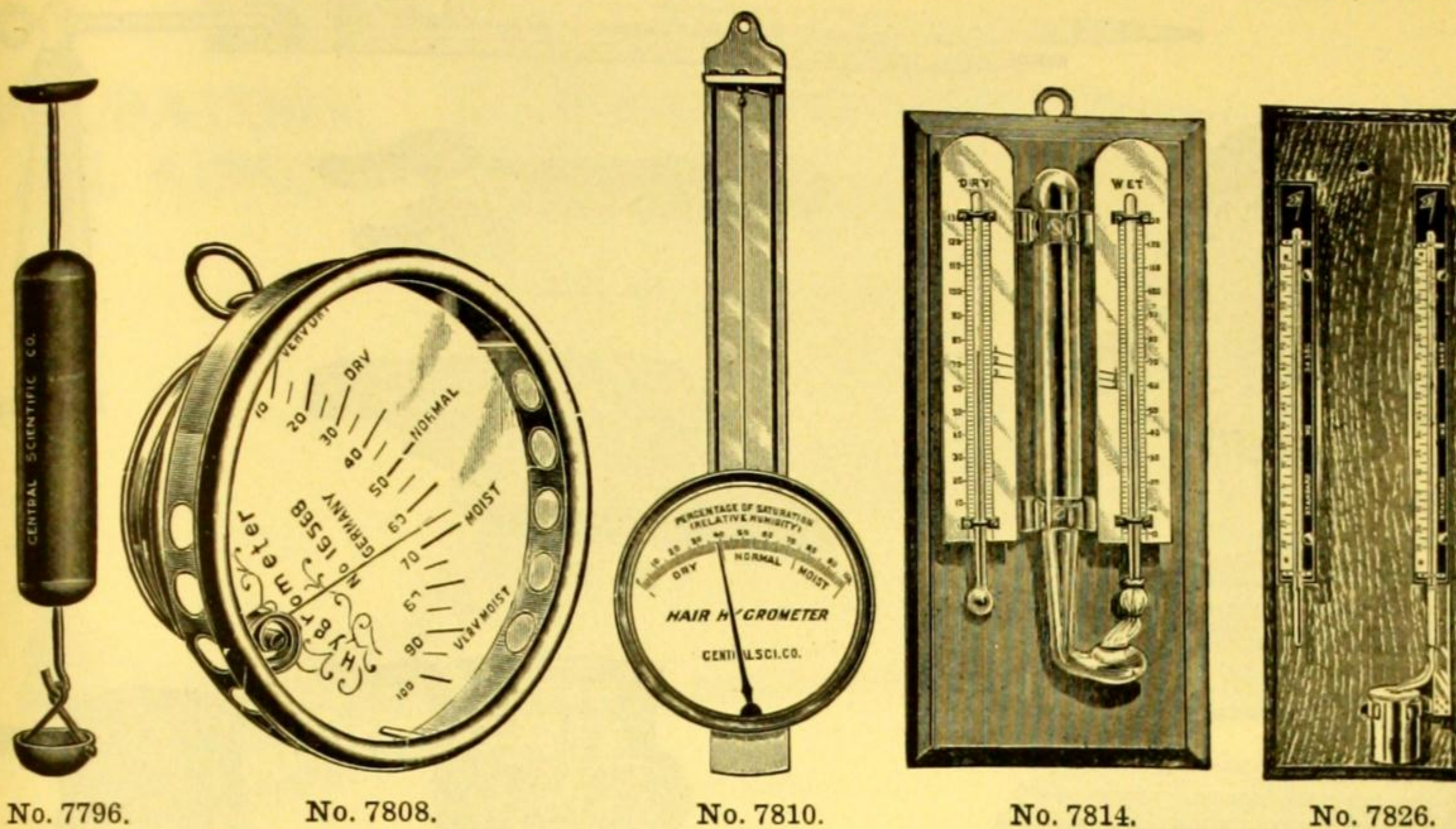


No. 7758.

7730. **HYDROMETER, Milk, Lactometer Scale, ordinary grade, graduated from 0° to 120° in 2° divisions. Length, about 11 inches. Graduated at 60°F.** \$0.75
7732. **HYDROMETER, Milk, Quevenne's Lactodensimeter, medium grade, with enclosed thermometer, graduated from 14° to 42° (1.014 to 1.042 specific gravity) in 1° divisions. Length, about 13 inches** 3.75
7734. **HYDROMETER, Milk, Quevenne's Lactodensimeter, same as No. 7732, but without enclosed thermometer. Length about 10 inches.** .90
7740. **HYDROMETER, Milk, Lactometer, United States Department of Agriculture Dairy Division Pattern, Specific Gravity Scale, highest quality, graduated from 24° to 37° (1.024 to 1.037 specific gravity) in 1/10° divisions. (See Bulletin 134 of the Bureau of Animal Industry, United States Department of Agriculture, page 16.) Length, about 11 inches.** 3.75

HYDROMETERS, OIL TESTING

7748. **HYDROMETERS, Oil Testing, small size, Baumé scale as adopted by the U. S. Bureau of Standards, modulus 140, with enclosed thermometer reading from 20° to 120°F., for use in small test jar. Length, about 7 inches. Graduated in 1° divisions to read correct gravity at 60°F.**
- | No. | A | B |
|----------------------|-------|-------|
| Range, degrees Baumé | 10-50 | 40-90 |
| Each | 5.25 | 5.25 |
7749. **HYDROMETERS, Oil Testing, small size, same as No. 7748, but with new American Petroleum Institute scale now accepted by the U. S. Bureau of Standards, modulus 141.5.**
- | No. | A | B |
|-------------------------|-------|-------|
| Range, degrees A. P. I. | 10-50 | 40-90 |
| Each | 5.25 | 5.25 |
7752. **HYDROMETERS, Oil Testing, small size, Baumé scale, modulus 140, same as No. 7748, but with smaller ranges and finer divisions for very accurate readings when small samples only are available. Graduated in 1/5° divisions.**
- | No. | A | B | C | D | E | F | G | H |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Range, degrees Baumé | 10-21 | 19-31 | 29-41 | 39-51 | 49-61 | 59-71 | 69-81 | 79-91 |
| Each | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 |
7752. **HYDROMETERS, Oil Testing, small size, American Petroleum Institute scale, same as No. 7749, but with smaller ranges as in No. 7752.**
- | No. | K | L | M | N | P | R | S | T |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Range, degrees A. P. I. | 10-21 | 19-31 | 29-41 | 39-51 | 49-61 | 59-71 | 69-81 | 79-91 |
| Each | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 | 5.75 |
7754. **HYDROMETER POCKET CARRYING CASE, of nickel-plated metal, for small hydrometer. Complete with hydrometer jar and flannel cover for hydrometer. Length, 7 1/2 inches.** 1.00
7758. **HYDROMETERS, Oil Testing, regular size, Baumé scale, modulus 140, with enclosed thermometer, with scale reading from 20° to 120°F., for use in 12 or 15-inch hydrometer jars. Length, about 15 inches. Graduated in 1/4° divisions.**
- | No. | A | B | C | D |
|----------------------|-------|-------|-------|--------|
| Range, degrees Baumé | 10-40 | 30-60 | 50-80 | 70-100 |
| Each | 5.75 | 5.75 | 5.75 | 5.75 |
7758. **HYDROMETERS, Oil Testing, regular size, same as No. 7758, but with American Petroleum Institute scale, modulus 141.5.**
- | No. | E | F | G | H |
|-------------------------|-------|-------|-------|--------|
| Range, degrees A. P. I. | 10-40 | 30-60 | 50-80 | 70-100 |
| Each | 5.75 | 5.75 | 5.75 | 5.75 |
7760. **HYDROMETERS, Oil Testing, regular size, Baumé scale, same as No. 7758, but with smaller ranges and very fine divisions for use when greatest accuracy is required. Graduated in 1/10° divisions.**
- | No. | A | B | C | D | E | F | G | H |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Range, degrees Baumé | 10-21 | 19-31 | 29-41 | 39-51 | 49-61 | 59-71 | 69-81 | 79-91 |
| Each | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 |
7762. **HYDROMETERS, Oil Testing, regular size, American Petroleum Institute scale, same as No. 7758A, but with smaller ranges as in No. 7760.**
- | No. | A | B | C | D | E | F | G | H |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Range, degrees A. P. I. | 10-21 | 19-31 | 29-41 | 39-51 | 49-61 | 59-71 | 69-81 | 79-91 |
| Each | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 |
7768. **HYDROMETER, Salt Salometer, medium grade, graduated from 0° to 100° in 1° divisions. Length, about 11 inches.** .75



No. 7796.

No. 7808.

No. 7810.

No. 7814.

No. 7826.

7773. **HYDROMETERS, Sugar, Brix Scale, highest quality, graduated in $\frac{1}{10}^{\circ}$ divisions, for use at $17\frac{1}{2}^{\circ}\text{C}$. Length, about 12 inches.**

No.	A	B	C	D	E	F	G
Range, degrees Brix.....	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Each	\$1.75	1.75	1.75	1.75	1.75	1.75	1.75

7774. **HYDROMETERS, Sugar, Brix Scale, medium grade, graduated in $\frac{1}{2}^{\circ}$ divisions, for use at $17\frac{1}{2}^{\circ}\text{C}$. Length, about 11 inches.**

No.	A	B	C
Range, degrees Brix.....	0-30	30-60	60-90
Each	.75	.75	.75

7776. **HYDROMETER, Sugar, Brix Scale, highest quality, for waste and wash water. Graduated from -5° to $+5^{\circ}$ in $\frac{1}{10}^{\circ}$ divisions, for use at $17\frac{1}{2}^{\circ}\text{C}$. Length, about 11 inches..... 1.50**

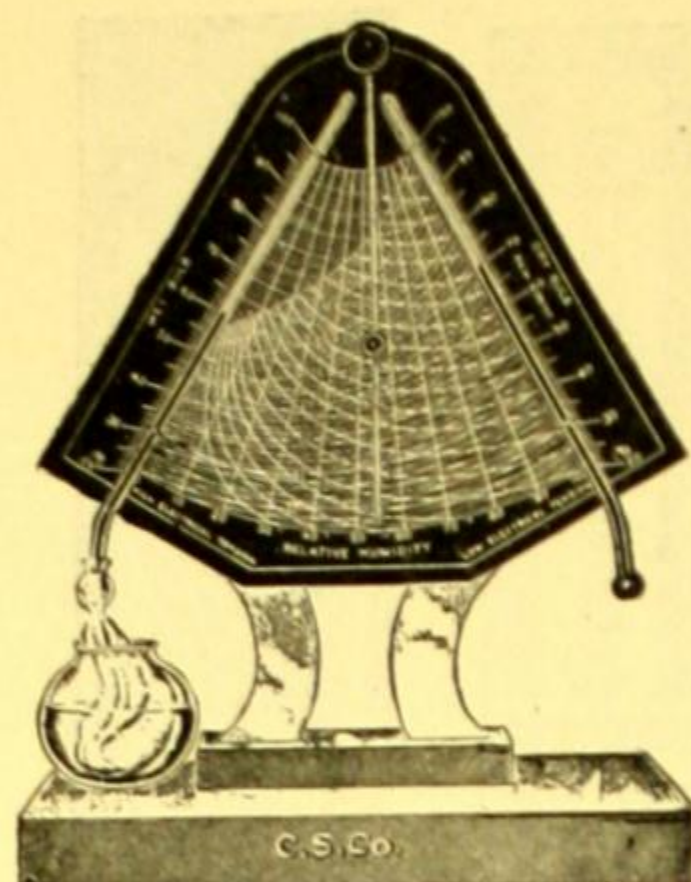
7782. **HYDROMETER, Syrup, Baumé Scale, medium grade, graduated from 0° to 50° in 1° divisions. Length, about 11 inches..... .75**

HYDROMETER JARS, see Cylinders.

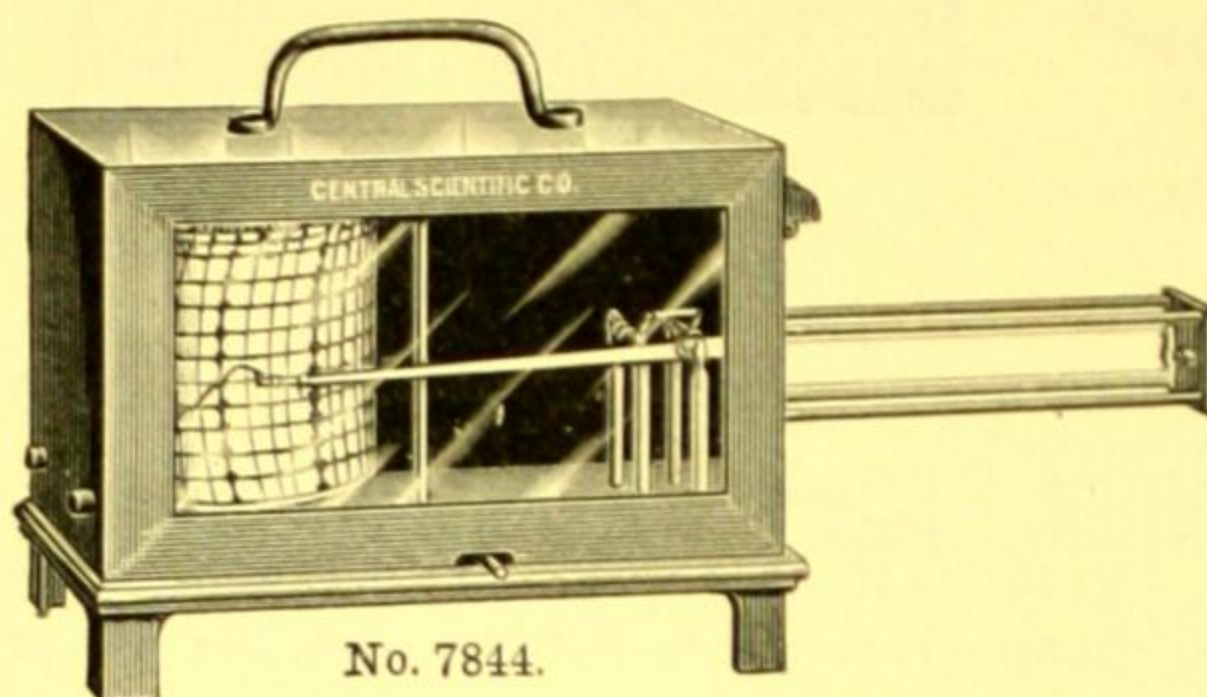
7796. **HYDROMETER, Nicholson, constant volume. Of brass, about 27 cm long over all, neatly finished** 2.75

HYGROMETERS

7809. **HYGROMETER, Simple Form, for indicating the humidity of the air without reference to tables. In spun brass case, 3 inch dial..... 3.00**
7810. **HYGROMETER, Hair. Scale denotes the humidity of the air without reference to tables. In brass case, 3 inch dial..... 12.00**
7814. **HYGROMETER, Mason, for determining humidity and dewpoint. Metal scale thermometer of approximate range from 10° to 120°F ., mounted with insulating support on a mahogany finish board $8\frac{1}{2}\times 4\frac{1}{2}$ inches. Glass cistern and special wick, with complete humidity tables... 5.00**
7815. **CISTERN only for No. 7814..... .75**
7816. **THERMOMETER, Dry Bulb, for No. 7814..... 2.00**
7817. **THERMOMETER, Wet Bulb, for No. 7814..... 2.00**
7820. **HYGROMETER, Mason, simpler form than No. 7814. Thermometers not raised, mounted on oak board $8\frac{1}{2}\times 4\frac{1}{2}$ inches. With complete humidity tables** 4.00
7821. **CISTERN only for No. 7820..... .75**
7822. **THERMOMETER, Dry Bulb, for No. 7820..... 1.60**
7823. **THERMOMETER, Wet Bulb, for No. 7820..... 1.60**
7826. **HYGROMETER, Standard, consisting of two Standard Thermometers (like No. 13720) mounted on a finely polished hardwood back 17×5 inches, metal cistern with wick, and certificate for each thermometer.... 13.50**



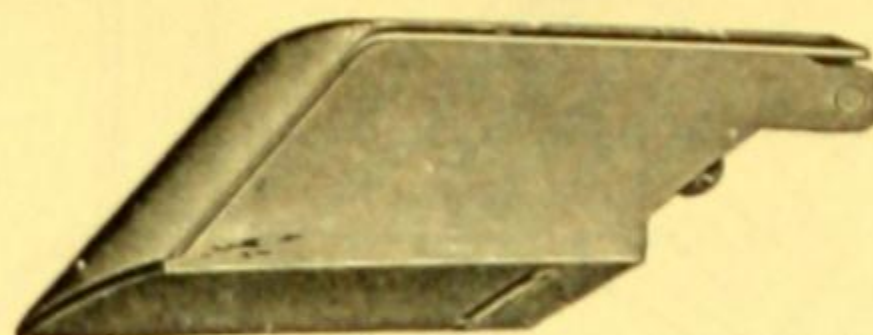
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No. 7844.



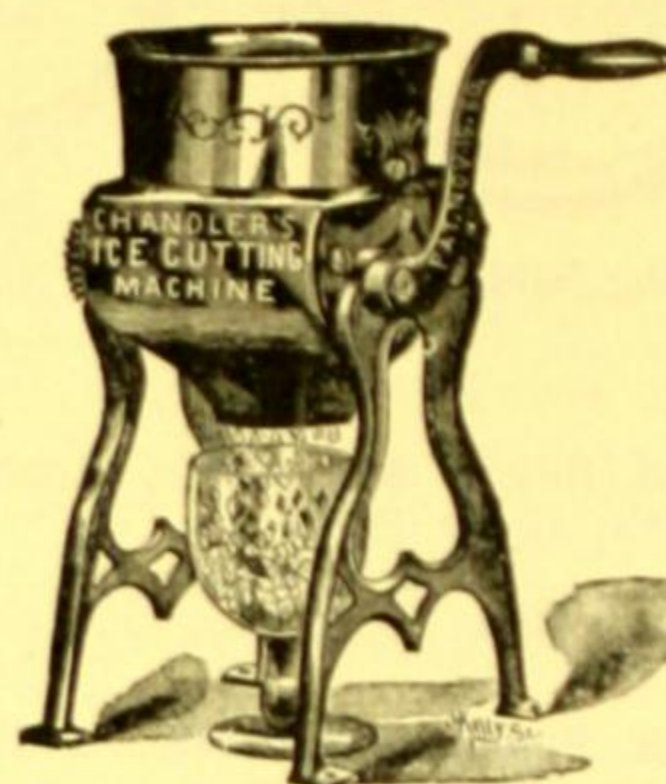
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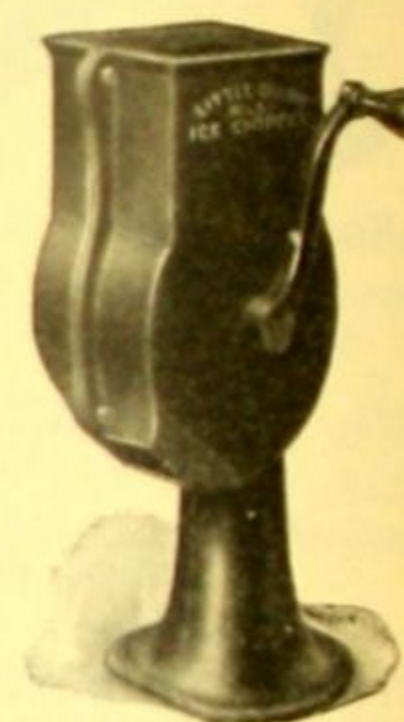
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No. 7848.



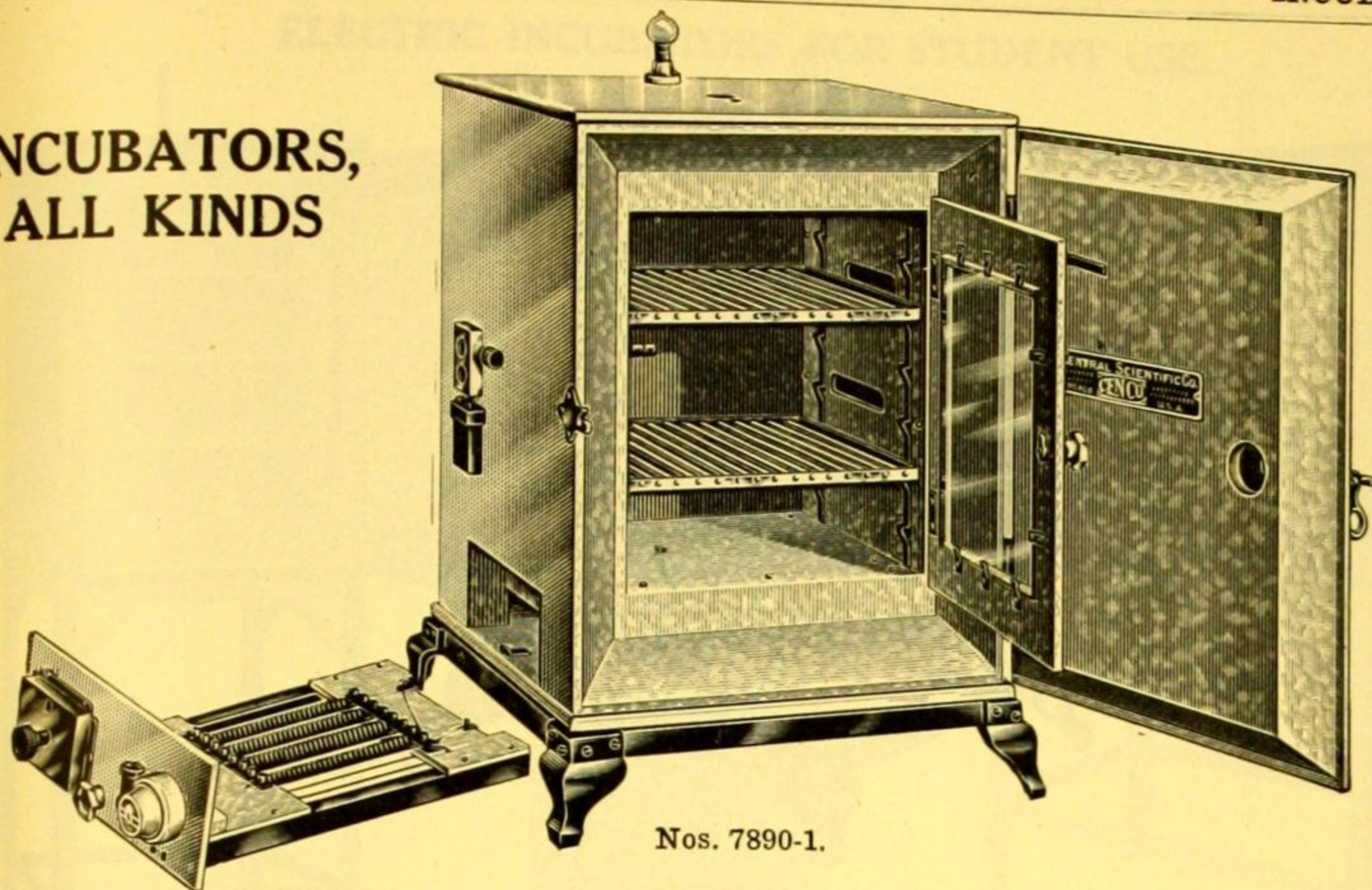
No. 7874.



No. 7876.

7832. **HYGROMETER (Hygrodeik)**, an improved form of the Mason Hygrometer. Consists of two thermometers, wet and dry bulbs, mounted upon the outer edge of a chart which has been plotted from new and corrected tables prepared under the direction of the U. S. Weather Bureau. This chart, while complicated in appearance, is very simple and obviates entirely the use of tables for temperatures between 20 and 120 degrees Fahrenheit. Size of instrument, 10x7 $\frac{3}{4}$ x3 inches. Full directions furnished with each instrument..... \$17.50
7833. **THERMOMETER, Dry Bulb**, for No. 7832..... 3.25
7834. **THERMOMETER, Wet Bulb**, for No. 7832..... 3.25
7844. **HYGROMETER, Registering (Hygrograph)**, for furnishing continuous record of humidity over a period of 7 days. Complete with charts for one year..... 60.00
7845. **CHARTS** for No. 7844..... Per box of 55 2.50
7848. **HYGROMETER, Sling Psychrometer**, designed for the purpose of obtaining quicker and more accurate results than are possible with the stationary wet and dry bulb instruments. Two special thermometers, carefully selected, are mounted on a nicely finished metal plate provided with a wooden handle and swivel, and a ring for suspending the instrument when not in use. Approximate range 0° to 100°F. in 1° divisions 6.50
7849. **THERMOMETERS** only of No. 7848..... Each 1.60
7852. **HYGROMETER, Sling Psychrometer, Standard Grade**. Similar to No. 7848, but with thermometers of highest grade, graduated in half degree divisions, and with a copper protecting case 16 $\frac{3}{4}$ inches long..... 11.50
7853. **THERMOMETERS** only of No. 7852..... Each 4.00
7860. **HYGROMETER WICK, Silk**, fits any of our hygrometers..... .15
7870. **ICE BAG**, of heavy canvas, 20x38 cm, for breaking ice25
7872. **ICE CHIPPER** for use in quickly chipping ice to small bits of a size convenient for laboratory purposes. Tinned iron frame, wood handle..... 1.10
7874. **ICE CUTTING MACHINE**. Height, 15 inches; weight, 14 pounds. Hopper, 4 $\frac{1}{2}$ x6 inches by about 4 inches deep. A compact, simple and strong machine which cuts ice into diamond shaped pieces from 1 to 2 inches long with ease and rapidity..... 10.00
7876. **ICE CUTTING MACHINE**, with blades which cut the ice into pieces about the size of a pea. Size of opening, 4x6 inches; height, 18 inches; space occupied, 9 $\frac{1}{2}$ x9 $\frac{1}{2}$ inches; weight, 30 pounds 18.00
7880. **ICE SHAVER** for shaving ice, coarse or fine, as may be desired; of tinned iron with removable steel cutter70
- IGNITION TUBES**, see Combustion Tubes; Tubes.

INCUBATORS, ALL KINDS



Nos. 7890-1.

DeKHOTINSKY ELECTRIC INCUBATORS FOR PRECISE WORK.

INCUBATORS, Triple Wall, DeKhotinsky Electrically Heated and Regulated (Patented), designed to provide a dependable incubator to meet the most exacting requirements of the bacteriologist.

Construction: These incubators are constructed of asbestos slate on a steel frame and are well finished in white enamel with all metal parts nickel-plated except the base, which is japanned. Three walls are provided, the space between the two outer walls being packed with the most efficient insulating material available, an 85 per cent magnesia asbestos mixture, which effectually prevents radiation of the internal heat; and the space between the inner walls, used to conduct the heated air upward from the heating units in the base, aids in distributing the hot air uniformly. Ports are provided in the inside walls of the incubator for the entrance of the heated air into the incubating chamber, in which it passes up and out through an opening in the false top. The location of these ports has been carefully and scientifically determined so as to provide a continuous current of heated air to every corner of the incubating chamber making the temperature uniform throughout. This feature (patented) is peculiar to the DeKhotinsky Triple Wall Incubator, and insures a uniformity of temperature not possible in electrically heated incubators of any other type. Double doors are also provided, the outer door being double walled and packed with the magnesia-asbestos heat insulating material and the inner door is of glass for the inspection of the interior without cooling the contents. The outer door is beveled on the edges, making close contact, when closed, with the walls, thus preventing leakage of heat. Between the two doors is a dead air space for insulation purposes.

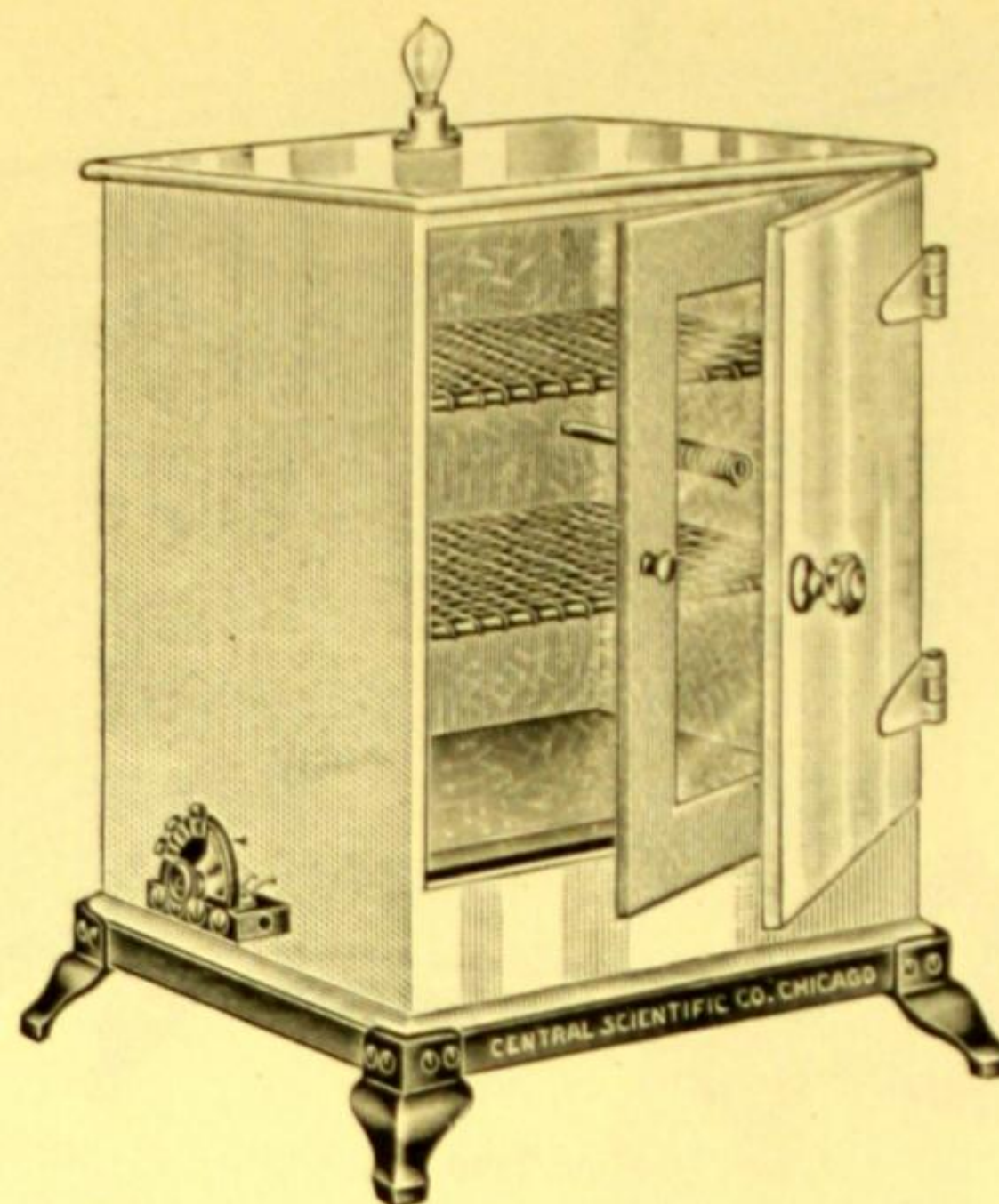
Heating of the incubator is effected by means of our standard heating units of Chromel wire wound on mica strips. These heating units are mounted in a removable tray or drawer which facilitates their removal for inspection or replacement without disturbing or materially cooling the contents. One of these heating units is connected in series with the contact points of the thermoregulator, while the remainder are connected in parallel to the switch contact springs and may be added to the circuit one at a time to obtain any desired temperature.

Temperature control of the incubator is secured by means of our bimetallic thermo-regulator (patented) which is made from invar-brass ribbon, and can be set at any desired temperature from that of the surrounding air up to the maximum heat capacity of the incubator. This range of temperature permits the use of these instruments as incubators, paraffine baths, drying ovens or sterilizers. The precision of action of this thermo-regulator is $\frac{1}{4}^{\circ}\text{C}$. The make-and-break contact of the thermo-regulator is located outside the incubator, to prevent the possibility of ignition of inflammable gases, developed in the inner chamber when used as a drying oven, which often occurs when the contact is made and broken inside. A pilot lamp on top of the incubator is connected in series with the thermo-regulator, enabling the operator to determine at a glance whether the incubator is regulating. These instruments can be operated on either A.C. or D.C. circuits. Complete with receptacle and five feet of flexible asbestos covered cord with separable attachment plug. No.

	B	C
Height inside, inches.....	14 $\frac{3}{4}$	19 $\frac{3}{4}$
Width inside, inches.....	12	17
Depth inside, inches.....	11 $\frac{3}{4}$	14
Shelf space, square inches.....	282	476
For 110 volts.....	\$140.00	220.00
For 220 volts.....	140.00	220.00

7890.

7891.



No. 7898.

7898. **INCUBATORS, Single Wall, DeKhotinsky Electrically Heated and Regulated (Patented), with bimetallic thermo-regulator.**

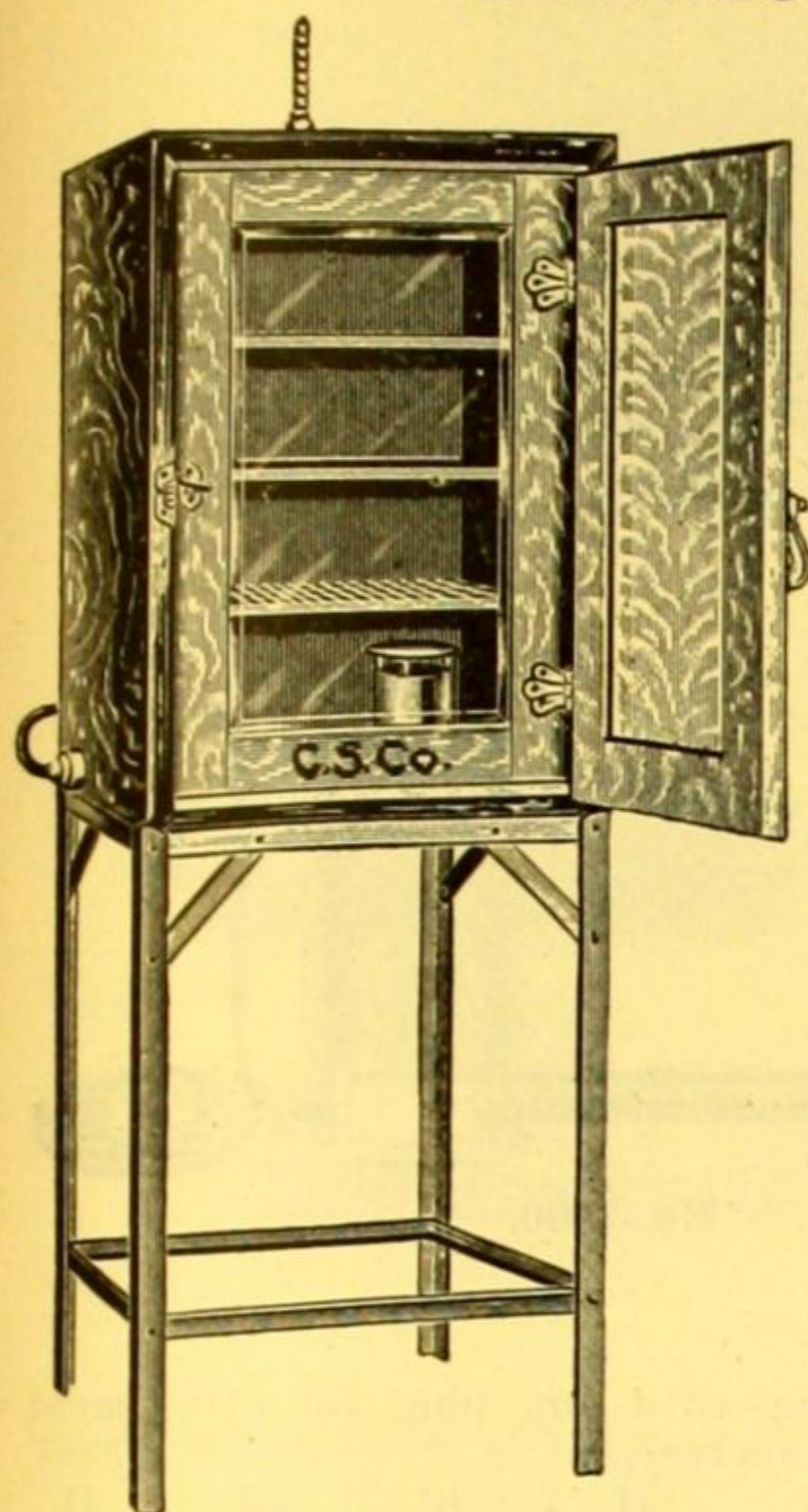
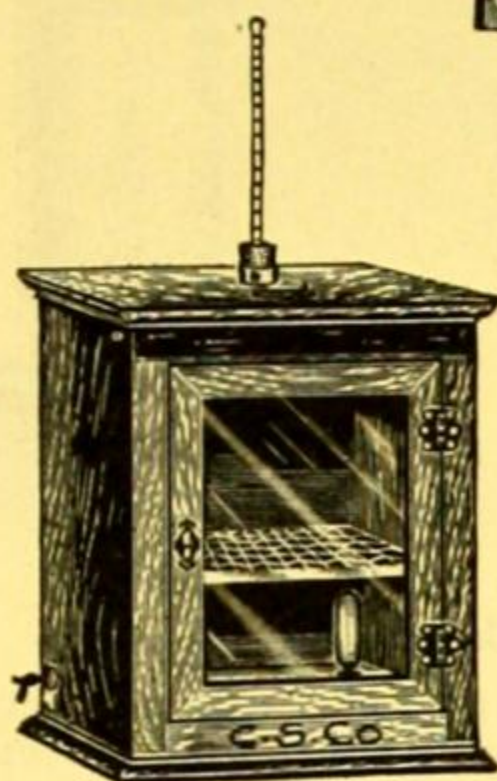
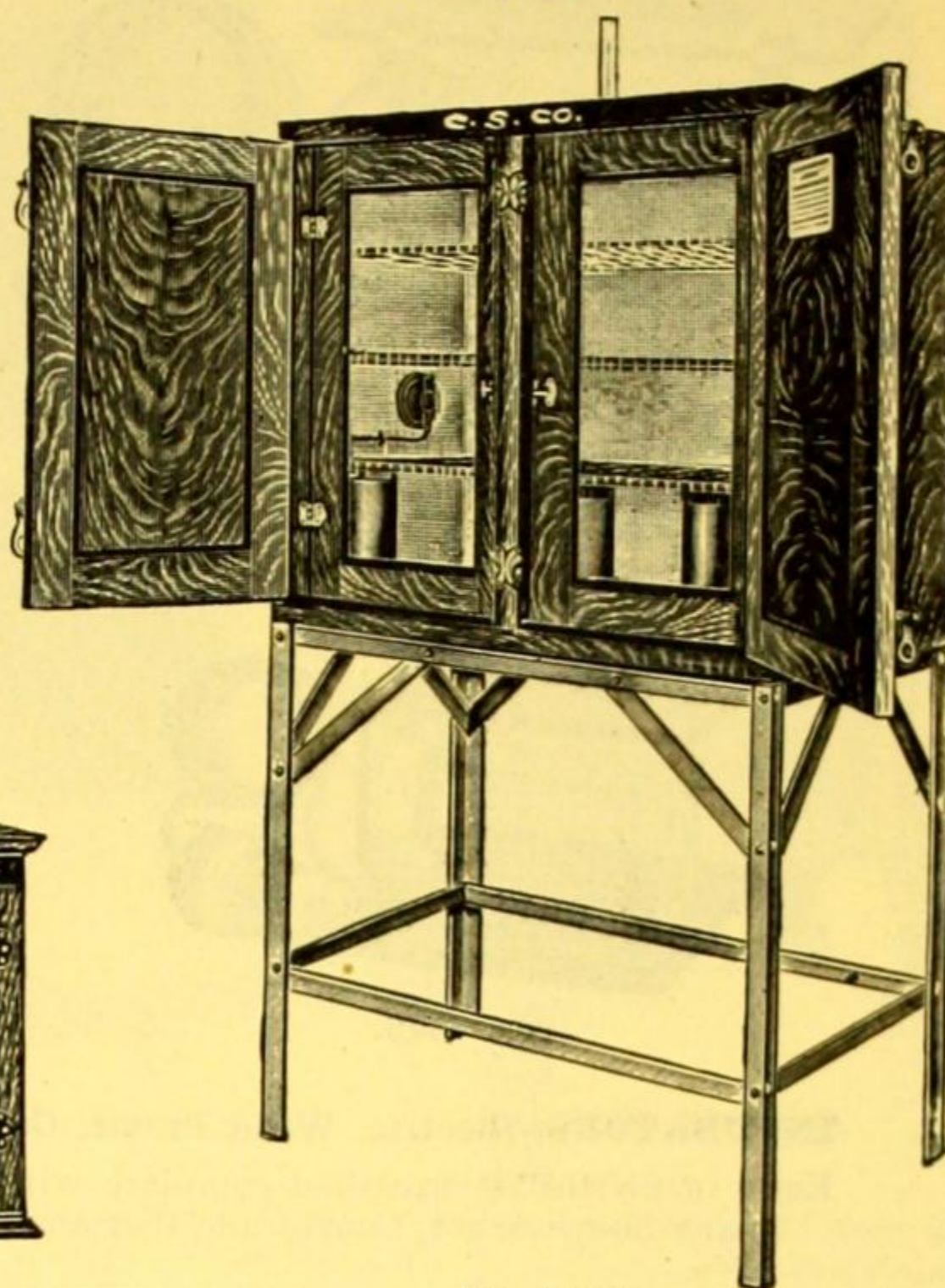
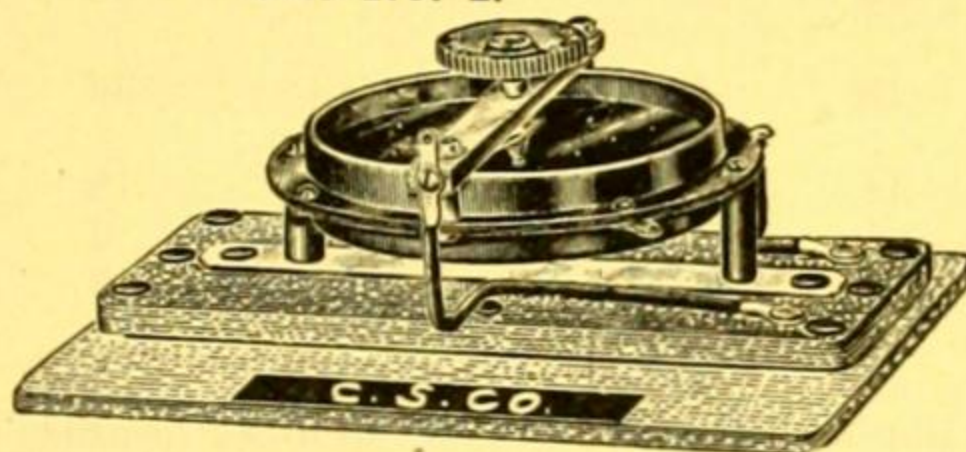
Construction: The incubator is built of $\frac{1}{4}$ -inch asbestos slate on a steel frame with a foundation of $\frac{3}{8}$ -inch asbestos slate. To effect the greatest uniformity of temperature possible in an incubator of the single wall type, the heating units are placed between two bottoms, the upper bottom being protected from the direct heat of the units by an iron deflector. Air heated by the units passes back between the bottoms, up through the space between the double back to the upper part of the incubator, and after circulating through the chamber returns to the inter-bottom space by way of an opening in the front part of the false bottom. Two shelves of the grid type are provided which, by means of racks, may be set at any desired height. An inner glass door permits inspection of the interior without cooling the contents. The incubator is mounted on a japped steel base.

Heating of the incubator is effected by means of our standard heating units, which are permanently connected to the switch contact springs. The heat regulating unit is in circuit with our bimetallic thermo-regulator for automatic control of the desired temperature.

Temperature control is effected by means of our bimetallic thermo-regulator, which is made from invar-brass ribbon, and can be set at any desired temperature from that of the surrounding atmosphere to the maximum heat capacity of the incubator, about 95°C . This range of temperature permits the use of these instruments as incubators, paraffine baths, or inactivation chambers. The precision of action of this thermo-regulator is $\frac{1}{4}^{\circ}\text{C}$. The make-and-break contact of the thermo-regulator is located outside the incubator, to prevent the possibility of ignition of inflammable gases developed in the inner chamber when used as a paraffine oven, which often occurs when the contact is made and broken inside. A pilot lamp on top of the incubator is connected in series with the thermo-regulator, enabling the operator to determine at a glance whether the incubator is regulating. These incubators can be operated on either A.C. or D.C. circuits. Complete with receptacle, and 5 feet of flexible asbestos covered cord with separable attachment plug.

No.	A	B
Height inside, inches.....	12	12
Width inside, inches.....	11	11
Depth inside, inches.....	9	9
Shelf space, square inches.....	220	220
For volts.....	110	220
Each	\$75.00	75.00

ELECTRIC INCUBATORS FOR STUDENT USE.

No. 7908.
Size No. 41.No. 7908.
Size No. 1.No. 7908.
Size No. 33.

Electro-Thermostat of No. 7908.

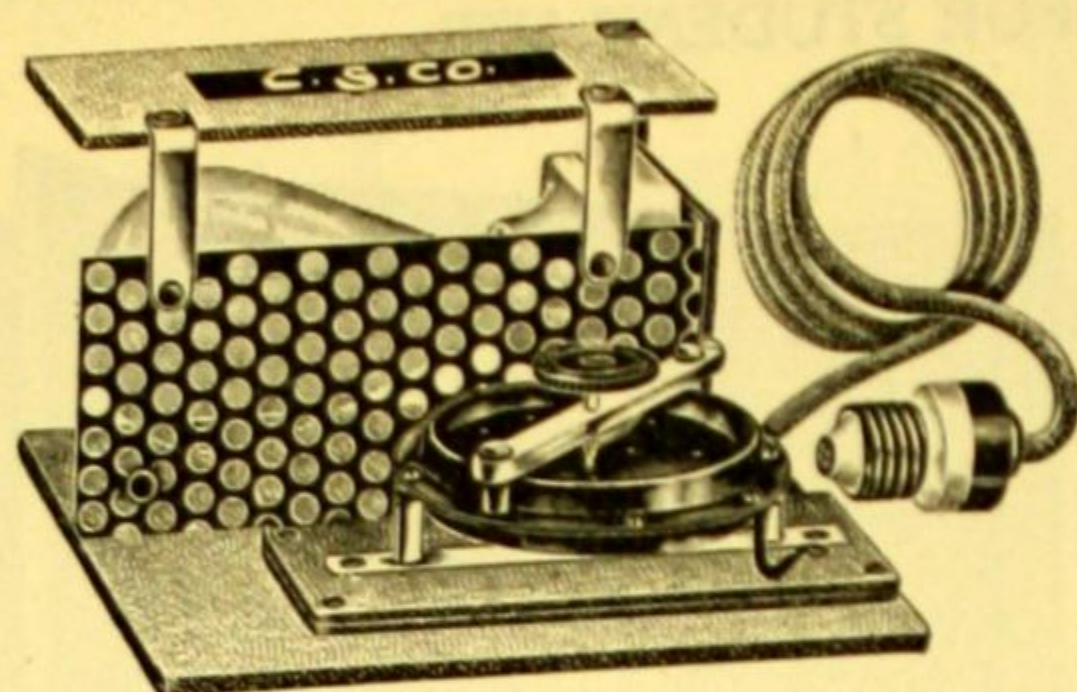
INCUBATORS, Electric, Wood Frame, with electro-thermostatic control.

Construction: The walls are constructed of successive layers of transite, tar paper, animal hair, tar paper and five-ply wood, the latter consisting of quarter sawed oak over fibrous chestnut. The No. 1 Incubator, because of its small size, is sheathed with a solid wall of quarter-sawed oak $\frac{1}{2}$ inch in thickness. The others all have the five-ply construction. By this construction, excellent insulation is secured, without danger of warping under the influence of heat or capillary moisture from inside the incubating chamber. The doors are provided with glass for observation of the contents, except in the larger sizes (Nos. 11-41), where an inner door of glass is provided with the entire outer door made of wood. The outer wall of quarter-sawed oak is finished in the natural color and highly polished.

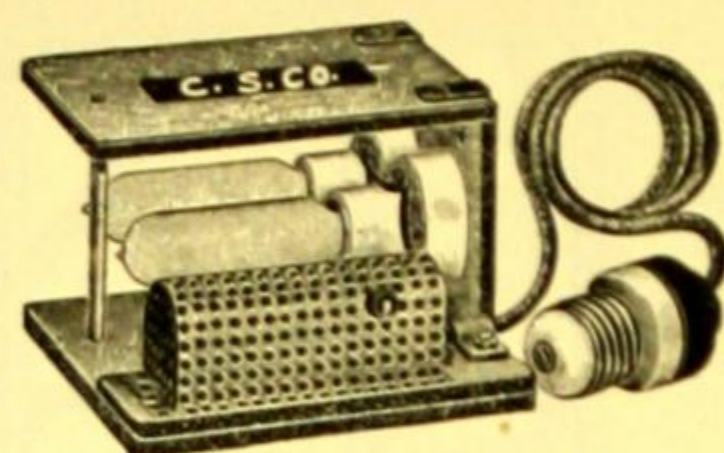
Heating is accomplished by means of incandescent carbon filament lamps, which heat quickly and cool quickly. The sizes of these are selected according to the cubic contents to be heated. If specified when ordered, the incubators can be furnished with wire wound electric heaters with pilot lights.

Ventilation is provided for by means of two holes in the smaller sizes, one near the bottom through which cold air enters, the other at the top through which the warm air escapes. In the larger sizes, there are four holes for entrance and escape of air, and the lamps are provided with chimneys for the purpose of creating air currents. In this manner, a constant air current is maintained.

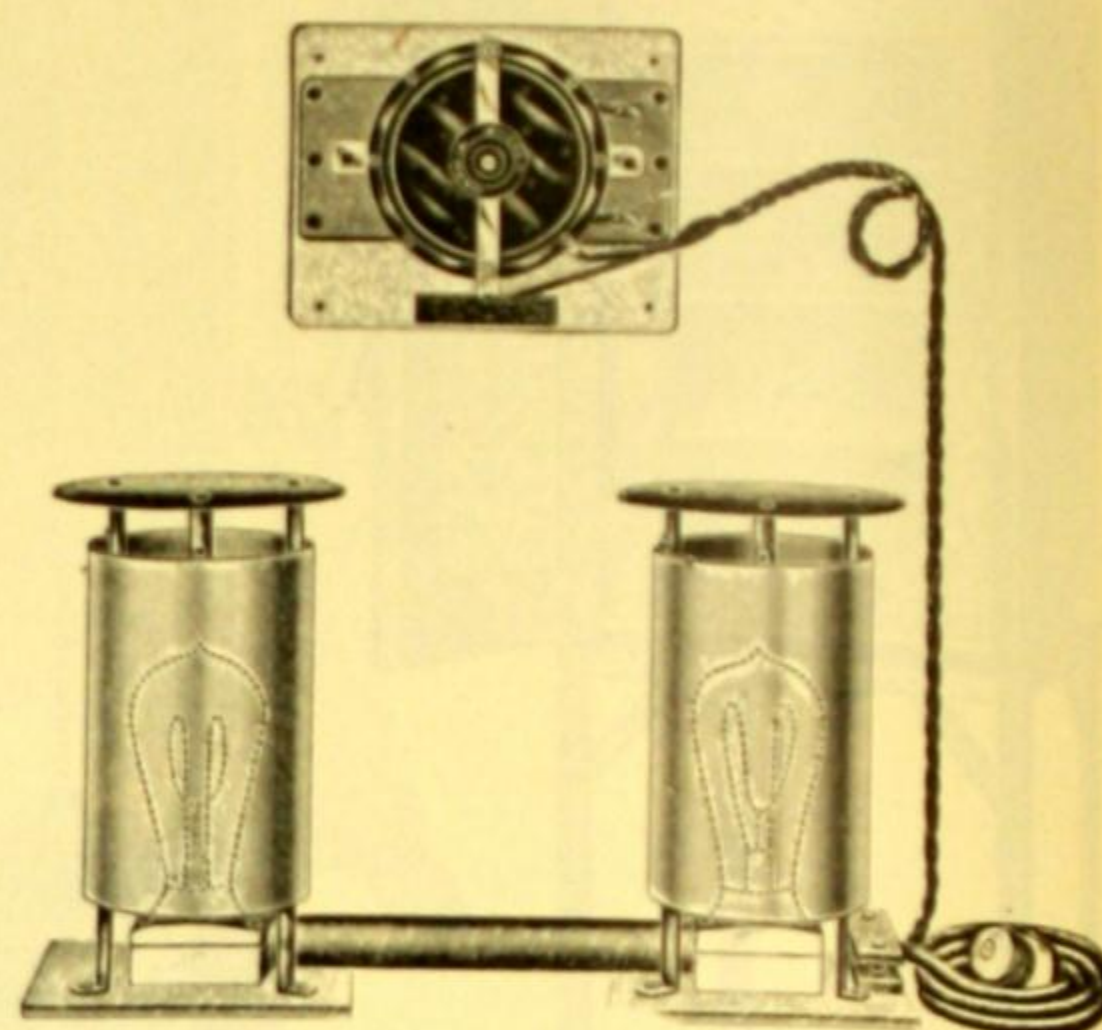
Regulation of temperature is effected by means of the electro-thermostat, which consists of a diaphragm of hard rubber and a metal disk riveted together. The difference in the expansion of the hard rubber and metal causes the former to become cup-shaped thus moving forward the center to which a platinum contact is attached. As the temperature is lowered the motion is reversed. By this means contact is alternately made and broken between two platinum points in circuit with the lamps, one attached to the diaphragm, the other to a thumb screw passing through the bridge across the thermostat, thus controlling the temperature. A condenser is provided by which the electric spark between the contact points is quenched, preventing the points from being quickly used up. The thermostat and condenser are mounted on a transite base.



No. 7916.



No. 7918.



No. 7920.

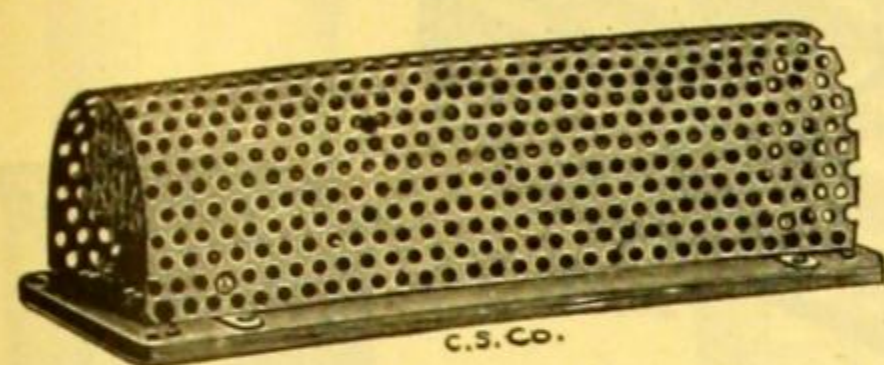
INCUBATORS, Electric, Wood Frame, Continued.

Each incubator is furnished complete with 6 feet of connecting cord and plug for attachment to any lamp socket, Centigrade thermometer, and wire screen shelves.

No.	1	2	3	11	12	13	31	32	33	41
Height inside, inches	9	26	12	15	50	30	30	26	30	30
Width inside, inches	7	18	9	12	18	36	20	18	36	20
Depth inside, inches	7	18	9	10½	18	18	18	18	18	18
No. of shelves	1	1	1	1	4	3	3	1	3	3
No. of lamps	1	2	2	2	2	3	2	2	3	2
Candle power of lamps ..	8	16	8	8	16	16	16	16	16	16
Doors	single	double	single	double	double, inner divided	double, in middle	double	double	double, in middle	double
Height of stand, inches	..	..	..	..	20	..	..	32	32	32
Shipping weight, lbs.	15	145	22	38	300	220	175	180	265	220
7908. For 110 volts, \$35.00	100.00	40.00	65.00	200.00	225.00	125.00	112.50	240.00	137.50	
7909. For 220 volts, 35.00	100.00	40.00	65.00	200.00	225.00	125.00	112.50	240.00	137.50	

For **PARAFFINE OVENS** of same construction as No. 7908 Incubators, see Paraffine Ovens No. 10122.

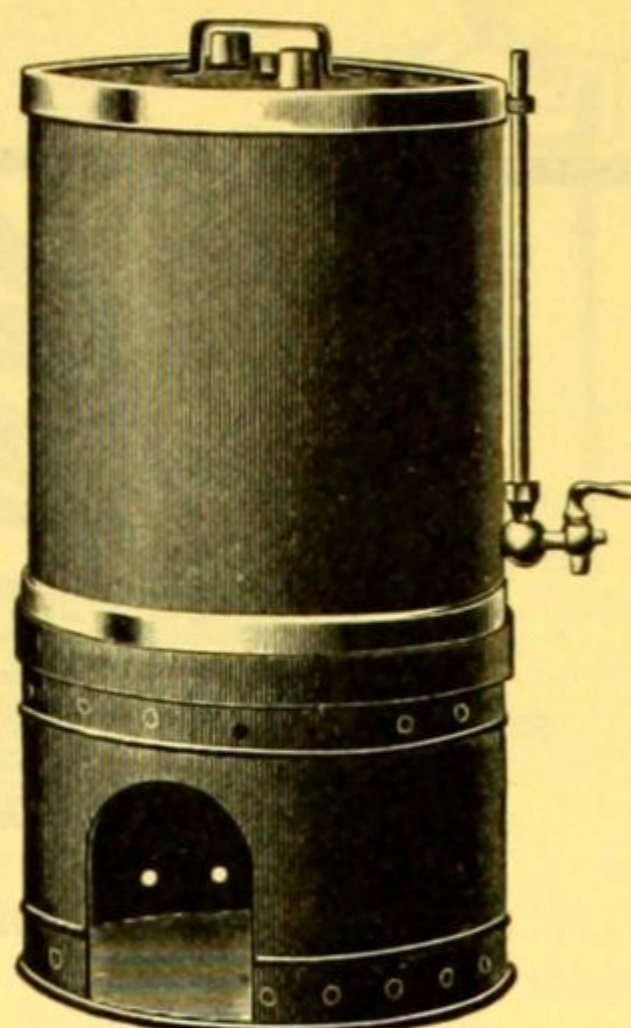
7916. **ELECTRIC HEATING DEVICE** for changing a gas heated incubator into an electric, consisting of an incandescent lamp, Electro-Thermostat No. 13756 and condenser mounted together on a transite base with cord and plug attached ready for connection to any 110-volt lamp socket. This outfit can be placed on the bottom of any incubating chamber with a capacity not exceeding 3600 cubic inches and the cord run through the hole usually found at the bottom of the incubator on the right hand side. If the incubator is water jacketed, the water should be removed to secure the best results. Space occupied by heater, 8x8x4½ inches high. Weight packed for shipment, 8 pounds. For 110 volts..... 16.00
7918. **ELECTRIC HEATING DEVICE** for electrifying small incubators, similar to No. 7916, but smaller, with two special 8 candle power lamps mounted on a ¾ inch transite base with thermostat, protected from above by a shelf of transite. Method of installing is the same as for No. 7916. Height of heating device, 3 inches; length, 4½ inches; width, 5 inches. Complete with attachment cord and plug, for 110 volts..... 16.50
7920. **ELECTRIC HEATING DEVICE** for large incubators, consisting of two 16-candle power incandescent lamps protected by metal chimneys and Electro-Thermostat No. 13756, wired together with attachment plug and cord ready to install. The method of installing is the same as given under No. 7916. This equipment can be used successfully in incubating chambers not exceeding 8200 cubic inches in cubical space. Weight packed for shipment, 12 pounds. For 110 volts 23.00



Nos. 7926A-B.



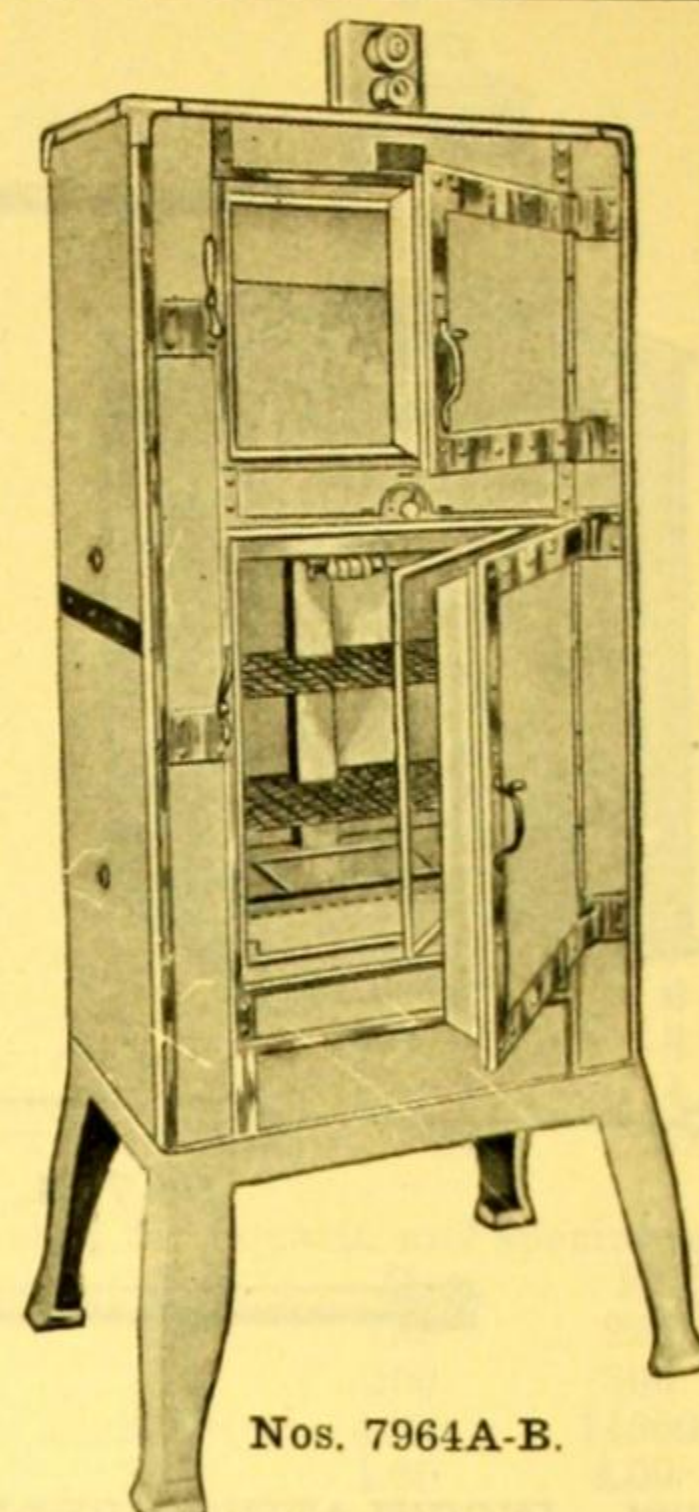
No. 7926E.



No. 7951.



No. 7926D.



Nos. 7964A-B.

7926. **ELECTRIC HEATING STOVES and UNITS** for electrifying gas heated incubators. These are for permanent installation and should be installed and wired by an experienced electrician. They should be used with Electro-Thermostat No. 13756 for temperature control. Nos. A, B and C are mounted on transite base and protected by a perforated metal shield. No. E is intended to be used with clips, such as are used for fuses. No. D can be attached by means of binding posts. All are wound for use on 110 volts.

No.	A	B	D	E
Size of heater, inches.....	14x5x3 $\frac{3}{4}$	9x3 $\frac{3}{4}$ x3	8x $\frac{1}{4}$	2 $\frac{5}{8}$ x $\frac{3}{4}$
Capacity, amperes	$\frac{3}{4}$ to 3	$\frac{3}{4}$ to 3	$\frac{1}{4}$	1 to 1 $\frac{1}{2}$
Recommended use	incubating rooms	large incuba- tors	small incubators	sterilizers
Each	\$16.00	16.00	1.00	2.25

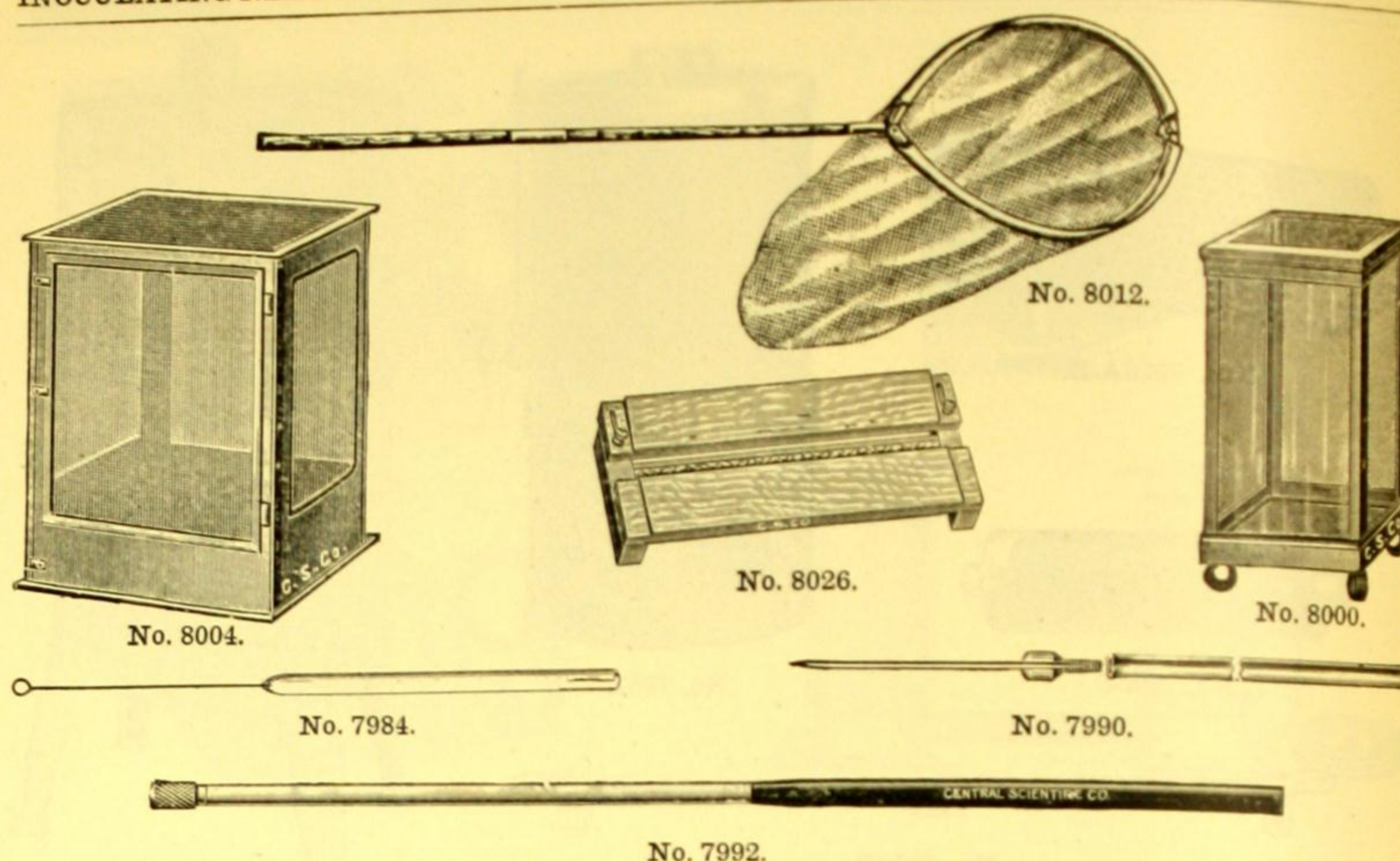
7951. **INCUBATOR, Double Wall, round form**, for use where only a small number of cultures is handled at a time. Made of polished copper with a 2-inch water jacket, covered with an insulating material. Two covers are provided, the inner one of glass to permit inspection of the contents. Dimensions inside, 9 inches high by 8 inches diameter; outside, 12 inches high by 12 inches diameter. Complete with water gage, stop-cock for draining, perforated tray, gas burner and sheet iron base 9 inches high..... 30.00

7964. **INCUBATORS, Low Temperature, Thelco, Electrically Controlled**, with walls composed of ten distinct layers of wood, porcelain, impervious sheeting, dead air spaces and wool felt. The outside covering is of porcelain, fused on steel, with aluminum trimmings around the doors, edges and corner. The Incubator contains two chambers, an upper for ice and a lower for the water-jacketed working compartment, each with its own outside door. The ice chamber is one-piece porcelain lined, and is equipped with a heavy galvanized ice rack. The capacity of this chamber is about 75 pounds of ice. The electric heating element, or plate, covers the bottom of the lower chamber and is removable. This heating element can be depended upon to run indefinitely without attention. The working compartment is placed within the lower chamber directly on the heating element. It is a heavy triple-walled copper jacket, the space between the walls filled with water, and the arrangement is such that while in use the water is in constant circulation. A constant water level attachment is placed on the outside of the incubator so that water in the walls of the copper jacket is automatically kept at a constant level.

The bimetallic thermostat is located in the top of the working compartment and is regulated by means of a milled head screw from the outside. A pilot lamp indicates when contact is made and broken. The thermostat can be quickly and easily set to give any desired temperature between 10°C. and 40°C.

The working compartment is provided with a cushioned glass door to allow inspection of the contents of the chamber without exposure to the warm outer air. Complete with two adjustable shelves, adjustable ventilator, snap switch, and connecting cord and plug.

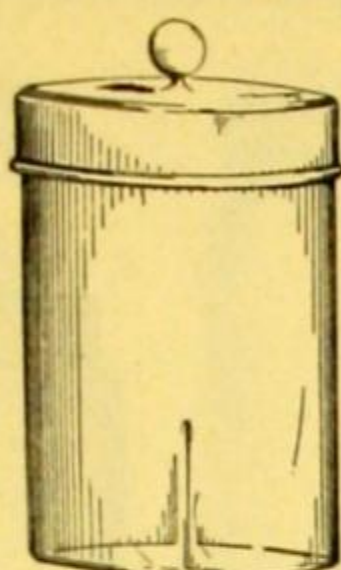
No.	A	B
For volts.....	110	220
Each	395.00	395.00



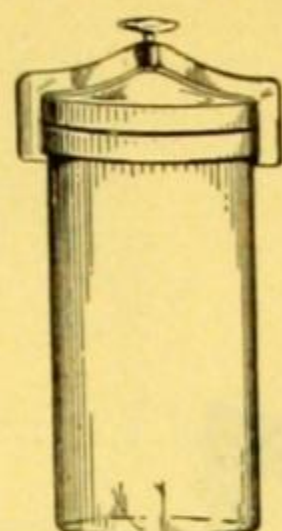
7984. **INOCULATING NEEDLE**, a platinum needle 40 mm long, of No. 28 wire, set in a glass handle 6 inches long \$0.70
 10% discount in lots of 12, 20% discount in lots of 144.
7986. **INOCULATING NEEDLE**, same as No. 7984, but with 80 mm of No. 27 wire..... 1.20
 10% discount in lots of 12, 20% discount in lots of 144.
7990. **INOCULATING NEEDLE HOLDER**, of brass, nickel-plated, with screw chuck for holding platinum or chromel wire from No. 28 to No. 24 inclusive. Length, 160 mm. **Without wire** .25
 10% discount in lots of 12, 20% discount in lots of 144.
7992. **INOCULATING Needle Holder, Kolle Type**, with rubber handle. The adjustable chuck permits wires of any size up to 24 B. & S. gage to be clamped tightly. The rubber handle will not overheat even during continuous use. Length over all, 10 inches..... .75
 10% discount in lots of 12, 20% discount in lots of 144.
7993. **Chromel Wire** for use with Nos. 7990 and 7992, in 4 inch lengths.
 No. 22 24
 Per package of 10..... .30 .30
 Per package of 100..... 2.70 2.70
- Platinum Wire for Nos. 7990-2, see general heading **Platinum Ware**.
8000. **INSECT BREEDING CAGE**, of zinc, glass front, with top, bottom and sides of wire gauze for ventilation. Top and bottom are removable. Size 5½x5½x10 inches high..... 5.50
8001. **Tray of galvanized iron**, water tight, for use with No. 8000 Insect Breeding Cage for aquatic insects 1.00
8004. **INSECT BREEDING CAGE**, all metal, non-corrosive, folding, easily adjusted. Top and sides of wire gauze for ventilation. Size 12x12x16 inches high..... 8.00
8010. **INSECT NET**, with collapsible steel frame 13½x11¼ inches when open, and one piece bamboo handle 30 inches long..... 3.25
8012. **INSECT NET**, similar to No. 8010, but with steel frame measuring 15x14 inches when open and with two-piece jointed handle 48 inches long 4.00
8018. **INSECT PINS**, black, with round yellow heads; very stiff with sharp points, in packages of 100.
 No. 00 0 1 2 3 4 5 6
 Per 10040 .40 .30 .30 .30 .30 .30
 Per 1000 3.00 3.00 2.40 2.40 2.40 2.40 2.40
8020. **INSECT PINS**, white, with round heads, in packages of 100.
 No. 0 1 2 3 4 5 6
 Per 10028 .28 .28 .28 .28 .28 .28
 Per 1000 2.25 2.25 2.25 2.25 2.25 2.25 2.25
8026. **INSECT SPREADING BOARDS**, for use in drying insects preparatory to mounting. Consists of two strips of hardwood cleated together leaving a groove in the middle in which the body of the insect is placed while the wings are pinned to the two strips.
 No.
 Length, inches A C
 Width, inches 12 16½
 Each 47½ 77½
- INTERVAL TIMER**, see Clock, Interval..... 1.60 2.00



Nos. 8040-2.



No. 8046.



No. 8054.



No. 8062.

JARS, ALL KINDS

JARS, Anaerobic Culture, see Anaerobic Culture Apparatus.

JARS, Animal, see Animal Holders.

JARS, Aquarium, see Aquarium Jars.

8040. JARS, Battery, cylindrical form, of green glass.

No.	A	B	C
Diameter, inches.....	4	5	6
Height, inches.....	5	7	8
Capacity, quarts.....	1	2	4
Each.....	\$0.35	.55	.75

10% discount in lots of 12.

8042. JARS, Battery, cylindrical form, of clear white glass, frequently used for aquaria and specimen

work. No.	A	B	C	D	E
Diameter, mm.....	100	100	125	150	225
Height, mm.....	100	125	175	200	300
Approx. capacity, cc.....	1000	1200	2500	4000	14000
Each.....	.60	.75	1.10	1.65	4.00
15% discount in original case containing....	60	48	30	12	6

For BATTERY JARS of other sizes and shapes, see general heading Batteries.

JARS, Bell Glass, see general heading Bell Jars.

JARS, Chidlow's Gas Collection, see Flour Testing Apparatus.

JARS, Chidlow Expansion, see Flour Testing Apparatus.

8046. JARS, Dressing, with loosely fitting knobbed cover.

No.	A	C
Height outside without lid, mm.....	100	150
Diameter outside, mm.....	100	150
Each.....	1.10	2.40

10% discount in lots of 12.

JARS, Hydrometer, see Cylinders.

JARS, Leyden, see Catalog F of Physical Apparatus.

JARS, Mouse, see Animal Jars.

8054. JARS, Museum, or Specimen, of clear white glass, with diameter of mouth same as that of body. With glass lid with rings for suspending specimens, rubber gasket for sealing, and metal clamp for fastening lid.

No.	A	C	E	F	G	J	K	M
Height, without lid, inches.....	4	8	6	8	12	8	12	18
Diam. inside, inches.....	2 1/4	2 1/4	3 1/2	3 1/2	3 1/2	5	5	5
Capacity, pints.....	1/2	1	1 3/4	2 1/2	4	5 1/2	8	12
Each.....	1.18	1.30	1.70	1.85	2.20	3.35	4.00	4.50
33 1/3% discount in case containing....	144	72	48	48	24	24	12	12

No.	N	R	S	U	V	X	Y
Height, without lid, inches.....	8	8	12	18	24	12	18
Diam. inside, inches.....	6 1/4	7 5/8	7 5/8	7 5/8	7 5/8	11 1/2	11 1/2
Capacity, pints.....	8	12	18	28	36	38	58
Each.....	4.30	6.60	7.50	8.75	10.00	15.75	19.75
33 1/3% discount in case containing....	12	12	6	6	6	2	2

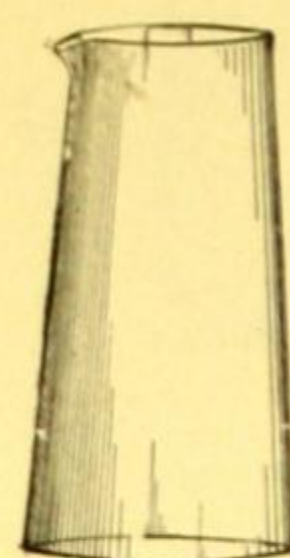
8056. Rubber Gaskets only for No. 8054.

Diameter, inches	2 1/4	3 1/2	5	6 1/4	7 5/8	11 1/2
Each.....	.05	.18	.40	.55	.90	2.00

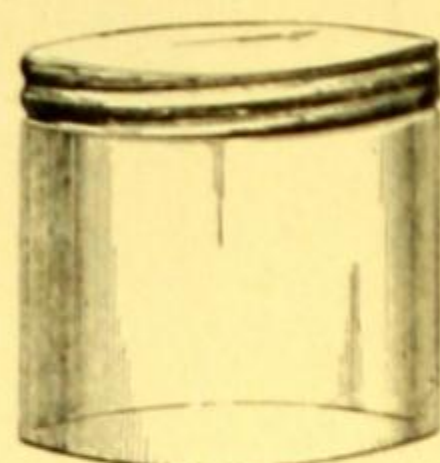
8062. JARS, Museum or Specimen, of clear white glass, wide mouth, with glass stoppers carefully ground in to make air tight seal. Sizes from A to K are carried in stock; other sizes will be furnished on short notice.

No.	A	B	C	D	E	F	G	H	J	K
Diameter of body, inches.....	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	3	3
Height to shoulder, inches.....	2	3	2 1/2	3 3/4	5	3 1/2	5	7	4	6
Diameter of mouth, inches.....	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2
Height to top of stopper, inches.....	3 1/2	4 1/2	4 1/2	5 1/2	6 3/4	7	7	9	6 1/4	8 1/4
Capacity, ounces.....	1 1/2	2 1/2	3 1/2	5	7	8	12	16	12	20
Each.....	.50	.55	.56	.60	.68	.70	.80	.85	.90	1.10

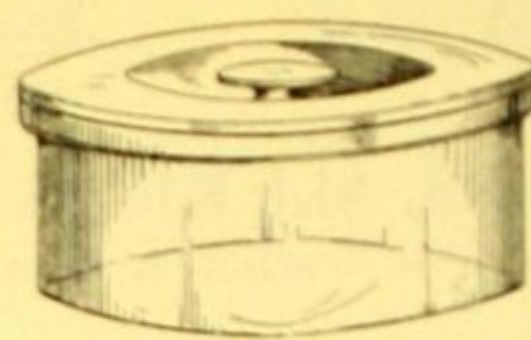
10% discount in lots of 12, 30% discount in lots of 144.



No. 8074.



No. 8078.



No. 8090.



No. 8086.



No. 8092.

JARS, Nessler, see Colorimetric Apparatus.

8074. JARS, Precipitating, of heavy glass with lip.

Capacity, pints	$\frac{1}{2}$	1	2	4	8	16	24
Each	\$0.40	.60	.80	1.75	2.35	4.00	7.75

10% discount in lots of 12.

JARS, Preparation, with glass covers, see Dishes, Preparation.

JARS, Sample, Screw-cap, see Bottles, Sample.

8078. JARS, Sample, glass, with metal screw cap; valuable for samples, etc.

Capacity, ounces	2	4	8
Per dozen	.90	1.20	1.60

10% discount in lots of 144.

8086. JARS, Specie, of glass with metal cover, for collecting gases, storing chemicals, etc.

Capacity, quarts.....	1	2	4
Each	.50	.60	1.00

10% discount in lots of 12.

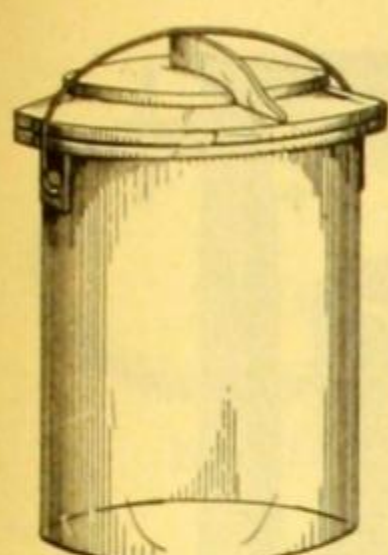
8090. JARS, Specimen, of glass, with knobbed cover loosely fitting. Knob is sunk to permit stacking of jars.

No.	A	B	C	D	F
Height, inches.....	2 $\frac{1}{2}$	3 $\frac{3}{4}$	5	6	7 $\frac{1}{2}$
Diameter of top, inches.....	6 $\frac{3}{8}$	6 $\frac{3}{8}$	8 $\frac{1}{2}$	9 $\frac{3}{4}$	11 $\frac{1}{2}$
Diameter of bottom, inches.....	5 $\frac{3}{4}$	5 $\frac{3}{4}$	7 $\frac{1}{2}$	8 $\frac{3}{4}$	8 $\frac{3}{4}$
Capacity, pints.....	2	3	6	9	16
Each	.50	.60	1.20	1.70	3.20
10% discount in case containing.....	36	28	12	9	5

8092. JARS, Specimen, of glass, with glass cover provided with ground rim for sealing.

No.	A	B	C	D
Height outside, inches.....	5 $\frac{7}{8}$	7 $\frac{1}{4}$	8 $\frac{1}{2}$	11
Diameter of mouth, inches.....	3 $\frac{1}{2}$	4 $\frac{1}{2}$	5 $\frac{1}{2}$	7 $\frac{1}{2}$
Capacity, quarts.....	1	2	4	8
Each	.30	.75	1.30	2.25

10% discount in lots of 12.



No. 8094.



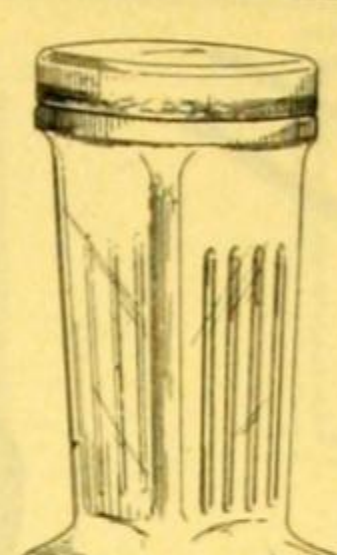
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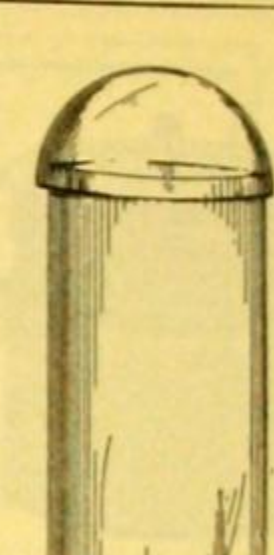
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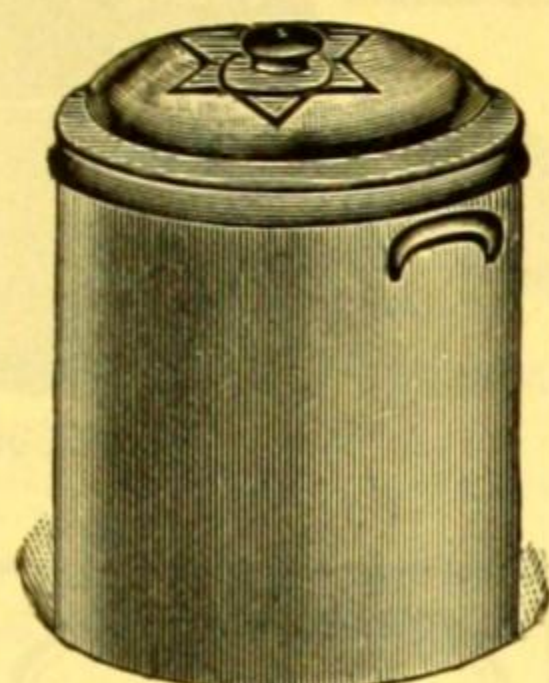
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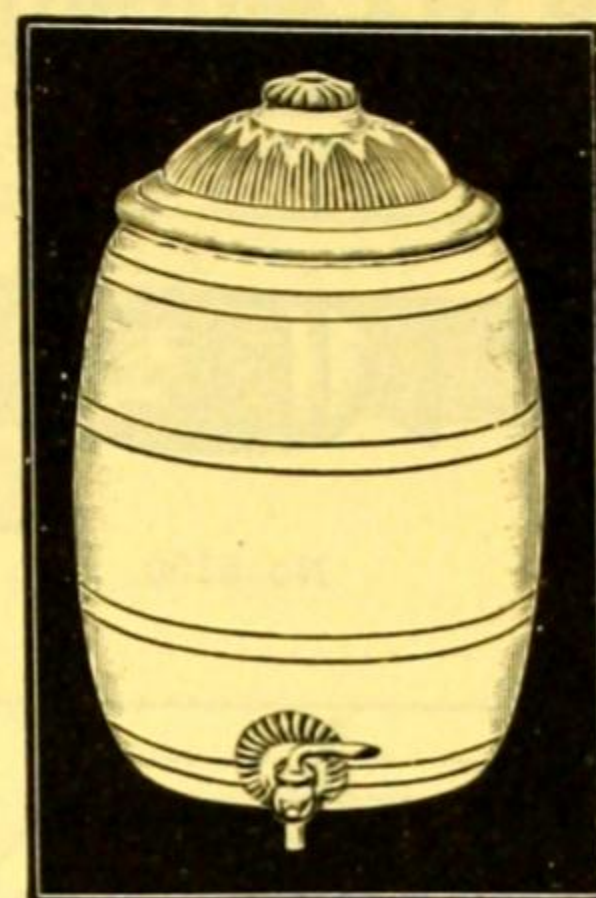
No. 8104.



No. 8106.



No. 8112.



No. 8114.

8094. **JARS, Specimen**, of clear glass with cover, clamping device and rubber gasket.

No.	A	B	C	D	E
Height, inches	2½	3⅛	3¾	5⅝	4⅝
Diameter, inches	2¾	3	3⅛	3⅝	4¼
Capacity, ounces	4¾	8	9	14	23
Each	\$0.20	.25	.30	.35	.55

10% discount in lots of 12.

8096. **JARS, Specimen, Calcutt's**, made entirely of glass, so there is no danger of corrosion. A half turn of the cover renders the jar air tight.

Capacity, pints	1	2
Each	.60	.70
Per dozen	6.00	7.00

JARS, Specimen, Inverted Show, see **Bottles, Inverted Show**.

8098. **JARS, Specimen, Mason's Fruit**, with screw-lids and rubber gaskets for sealing.

Size, quarts	½	1
Per dozen	1.40	1.60

10% discount in lots of 144.

8100. **JARS, Specimen, Sure Seal**, with glass cover, metal clamping device and rubber gaskets.

Size, quarts	½	1
Per dozen	2.00	2.20

10% discount in lots of 144.

8104. **JARS, Staining, Coplin's**, for ten 3x1-inch slides, with glass lid.....each .35

10% discount in lots of 12, 20% discount in lots of 144.

8106. **JAR, Staining, Naples**, of clear glass, with loosely fitting hemispherical cover. Height, 90 mm; diameter, 35 mm..... .55

8112. **JARS, Stoneware**, with handles and covers for storing ordinary chemicals. Preferable to a galvanized iron can for refuse. Capacity, gallons.....

	1	2	4	6
Diameter, inches	6½	8¼	10¼	10¾
Height, inches	8	8¾	10½	13
Each	.75	1.15	2.00	3.00

Note:—Owing to the high cost of boxing (charged by us at cost) and transportation on stoneware jars, we recommend that they be purchased from a local merchant who is able to minimize these costs by carload purchases.

8114. **JARS, Stoneware**, with cover and nickel-plated metal stop-cock, for storing distilled water, etc.

Capacity, gallons	3	5	8	10
Each	4.00	5.50	8.00	9.50

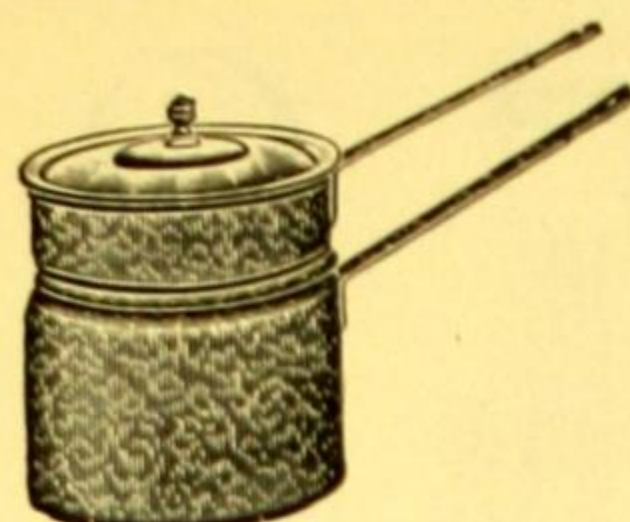
Note:—Boxing will be charged on No. 8114 at cost.

8120. **JARS, Tumblers, Jelly**, with cover, 200 cc capacityper dozen .60

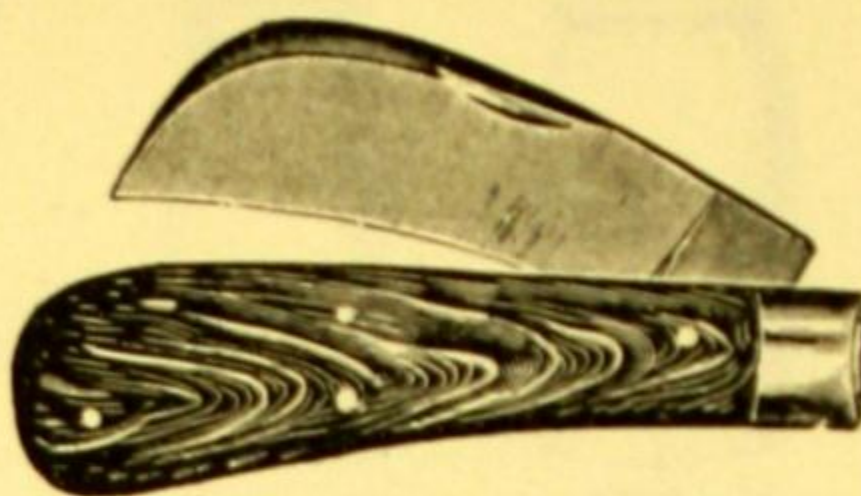
10% discount in lots of 144.

KETTLES

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.



No. 8142.



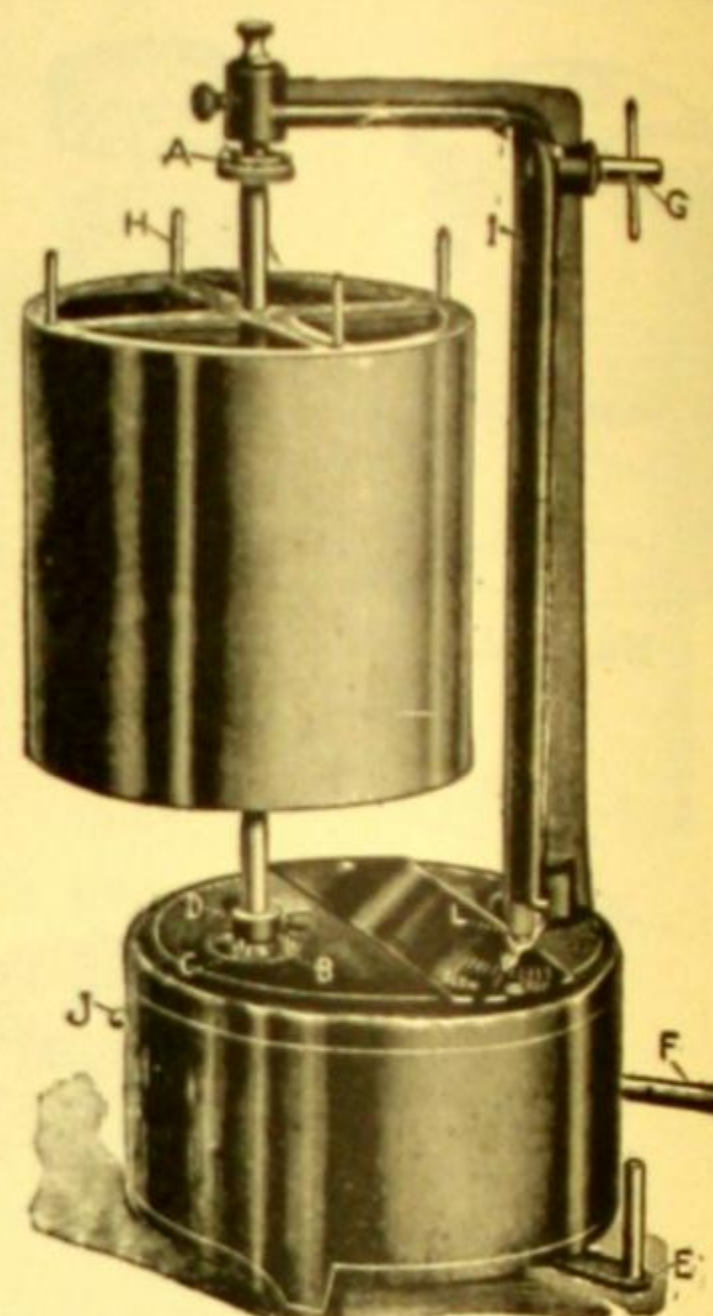
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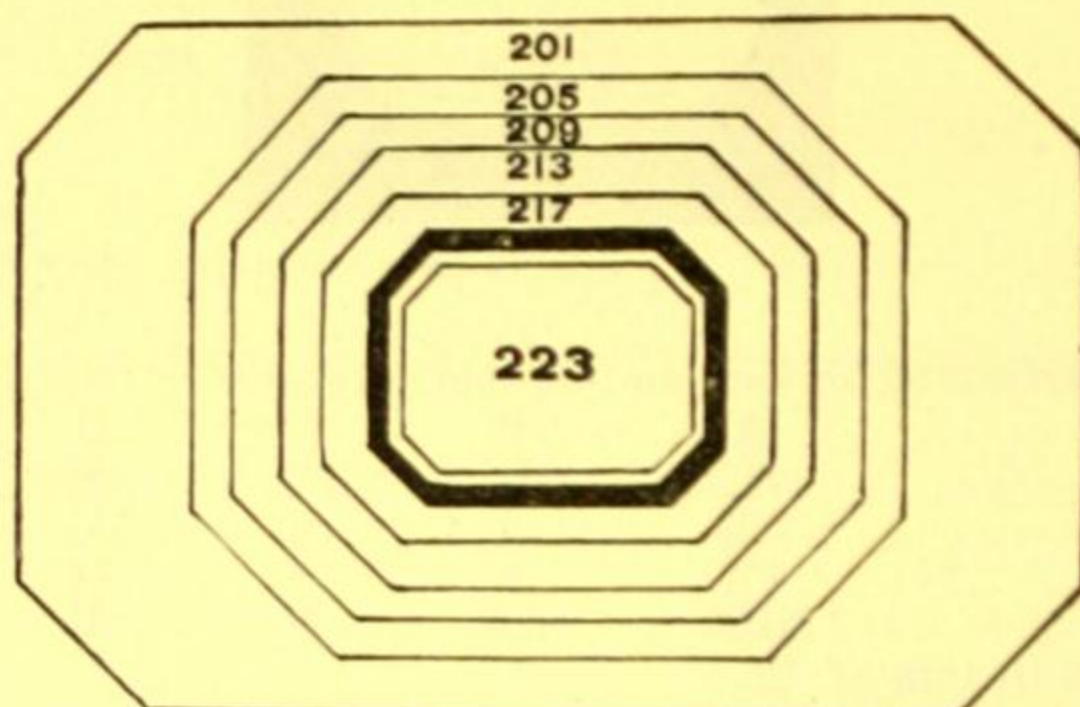
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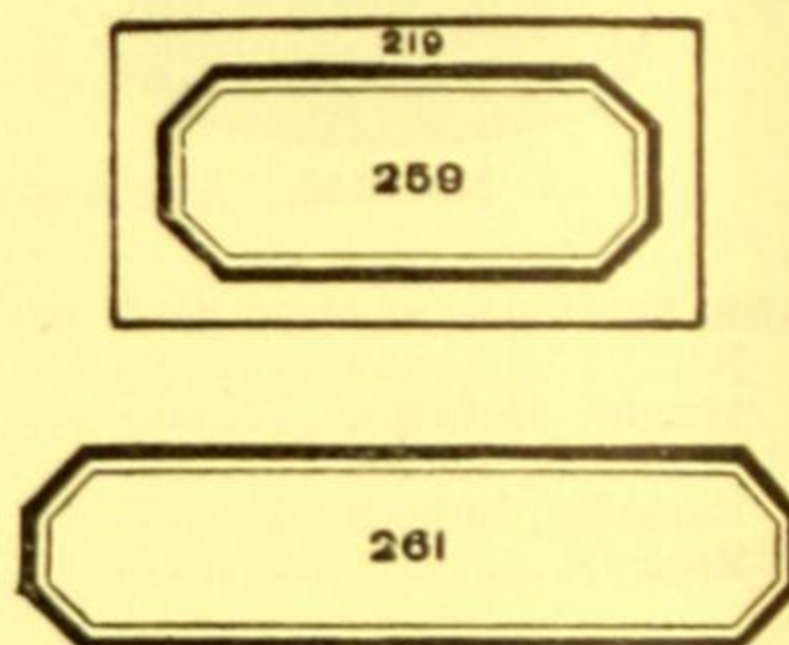
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No. F6065.

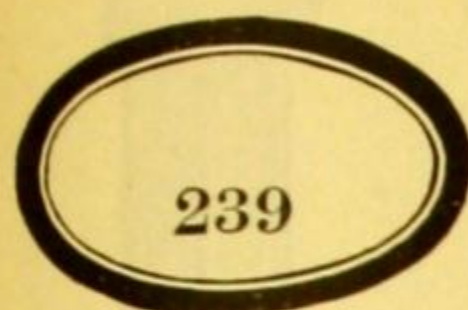


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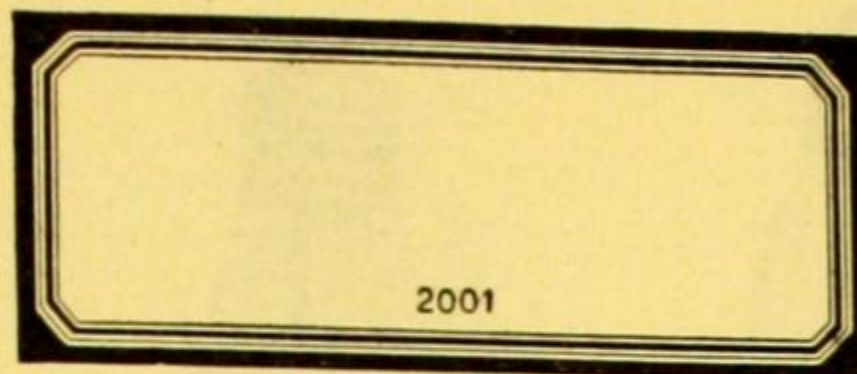


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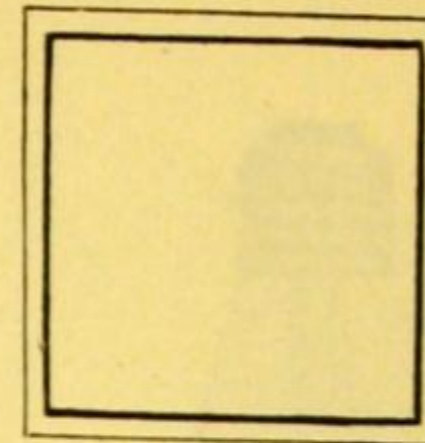
8142. **KETTLES**, Infusion, double boiler, of graniteware, with tin cover.
 Manufacturer's rated capacity of inner kettle, quarts..... 2 4
 Each \$1.10 2.30
- KNIFE**, for glass cutting, see **Glass Tubing Cutters**.
- KNIFE**, for mixing dough, see No. 5938.
8146. **KNIFE**, Laboratory, good steel blade 4 inches long; round wood handle. Useful for cutting corks, etc.25
8148. **KNIFE**, Pocket, one blade, excellent quality steel, iron lined cocoa handle, 4-inch..... 1.00
8150. **KNIFE**, Pocket, two blades crocus polished, iron lined, stag handle, 4-inch. An excellent all-round knife 1.50
- F6065. **KYMOGRAPH**. This Kymograph may be used either vertically or horizontally. The drum carrying the smoked paper, on which the tracings are made, is 15 cm in diameter by about 15 cm long and is rotated by means of a strong spring motor, which is enclosed in a heavy iron base. The speed is uniform, and is regulated by means of a magnetic control. Starting, stopping and regulation of speed is all done from the outside. The shaft carrying the drum is reversible, and each end has a clutch, in order to secure two speeds, a slow and a fast, both of which may be varied by means of the magnetic control. Range of slow speeds from one revolution in 18 minutes to one in 55 seconds; of fast speeds from one revolution in 42 seconds to one in 8 seconds. Complete with 100 sheets of gummed glazed paper..... 90.00
- F6069. **Paper**, glazed and gummed, for use with No. F6065. Size, 15x48 cm. Per 100 sheets 2.00
8160. **LABELS**, Dennison's Gummed, rectangular shape with red border.
- | No. | 201 | 205 | 209 | 213 | 217 | 219 | 223 | 259 | 261 |
|------------------------|------|------|------|------|------|------|------|------|------|
| Length, mm | 64 | 42 | 37 | 30 | 27 | 38 | 21 | 33 | 52 |
| Width, mm | 40 | 34 | 28 | 24 | 20 | 19 | 17 | 14 | 14 |
| Per box | .10 | .10 | .10 | .10 | .10 | .10 | .10 | .10 | .10 |
| Per carton of 12 boxes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |



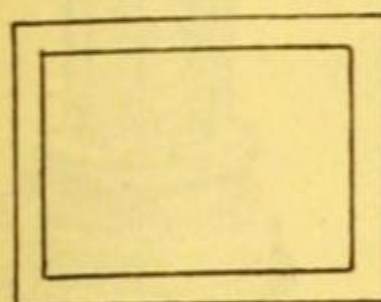
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No. 8166.



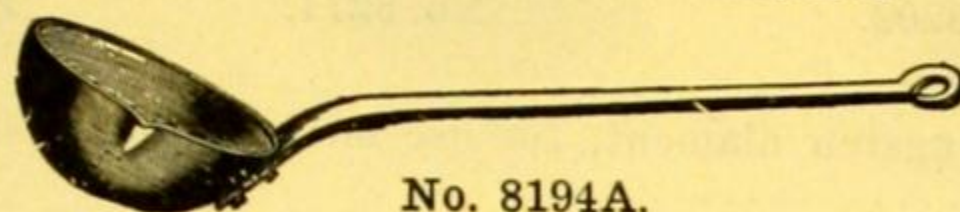
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No. 8178.



No. 8172.



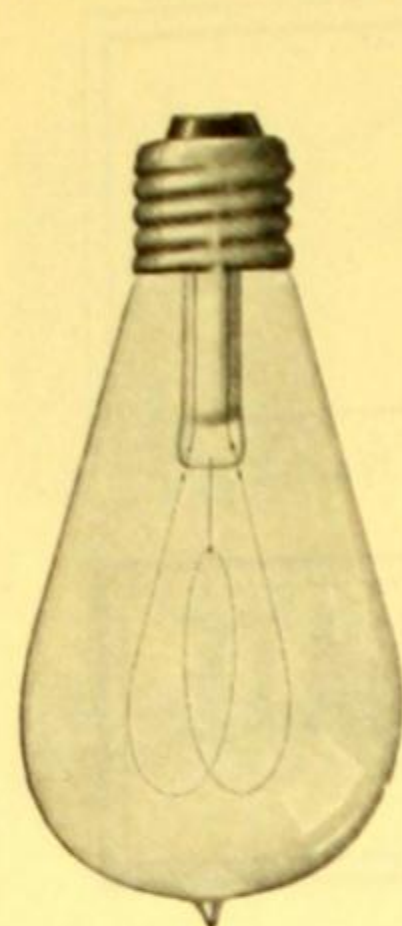
No. 8194A.

8164. **LABELS, Dennison's Gummed, oval shape with red border.** No..... 229 239 241
 Length, mm 42 27 21
 Width, mm 30 17 14
 Per box \$0.10 .10 .10
 Per carton of 12 boxes 1.00 1.00 1.00
8166. **LABELS, Dennison's Gummed, rectangular shape, large size, with red border, in boxes of 100.**
 No. 2001 2003 2004 2005 2007
 Size, inches $1\frac{1}{2} \times 3\frac{7}{8}$ $2 \times 4\frac{3}{4}$ $1 \times 2\frac{3}{4}$ $1\frac{7}{8} \times 4$ $1\frac{5}{8} \times 2\frac{7}{8}$
 Per box20 .30 .15 .25 .15
 Per carton of 10 boxes 2.00 3.00 1.50 2.50 1.50
8172. **LABEL BOOK, containing labels for the most used chemicals and reagents, each label having name and symbol. Gummed, perforated, and arranged so that they may be easily removed without destroying the book. (Labels should be covered with melted paraffine after being put on the bottle, to protect them from acids, etc.) Book contains about 500 labels.....** .50
8176. **LABELS, Gummed, Microscope Slide, of white paper with light border, 22 mm square, in boxes of 100.....** per box .10
 10% discount in lots of 10 boxes, 20% discount in lots of 100 boxes.
8178. **LABELS, Gummed, Microscope Slide, same as No. 8176, but rectangular, 22x15 mm, in boxes of 100.....** per box .10
 10% discount in lots of 10 boxes, 20% discount in lots of 100 boxes.
8190. **LACQUER, Colorless, for preserving polished metal surfaces. In ounce bottles.....** per ounce .25
8192. **LACQUER, Gold, in 1 ounce bottles.....** per ounce .30
- LACQUER BRUSH, see Brush, Lacquer.**
- LACTOMETERS, see Hydrometers.**
- 8194A. **LADLE, of wrought iron with handle and lip. Useful for fusing metals. Diameter, 2½ in.** .35
- LAMPS, Alcohol, see general heading Burners.**
- LAMPS, Microscope, see Microscope Accessories.**

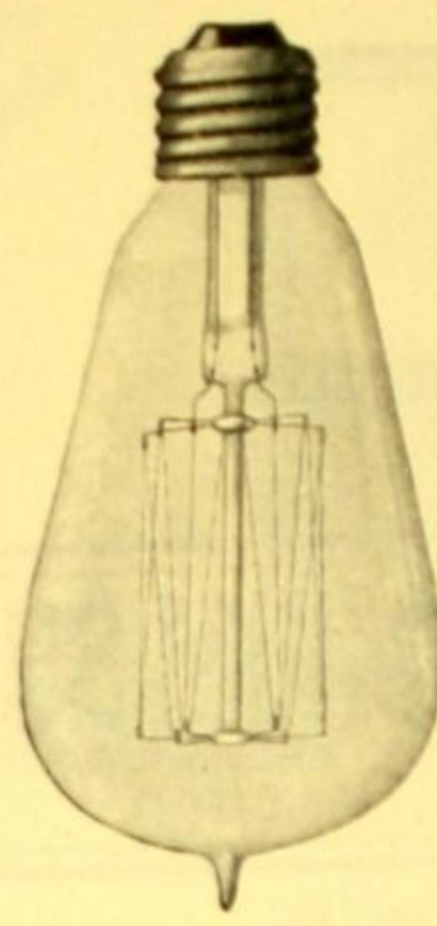
LAMPS, INCANDESCENT

In selecting incandescent lamps from those listed below, attention should be paid to the fact that the consumption of carbon filament lamps is approximately 3 watts per candle power, while that of tungsten filament lamps is approximately 1¼ watts per candle power.

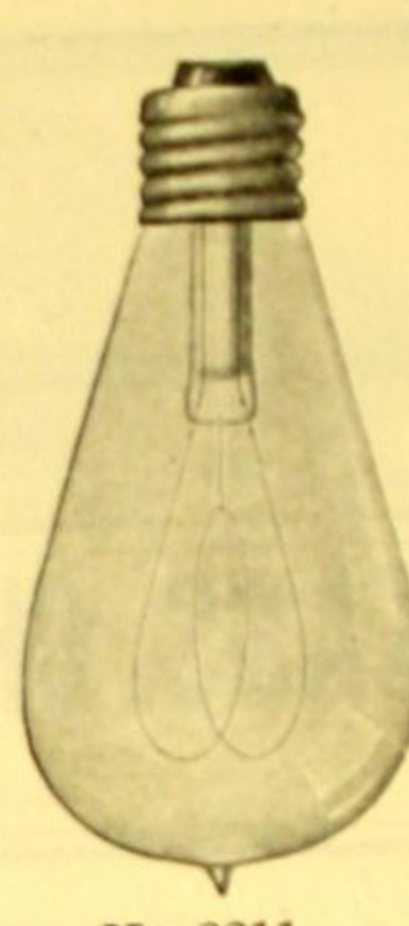
8196. **LAMPS, Incandescent, Miniature, tungsten filament, threaded base to fit No. 5124 Receptacle.**
- | No. | A | C |
|-----|-----|-----|
| 1 | 1 | 4 |
| 2½ | 2½ | 6 |
| .25 | .25 | .40 |
- Each
8197. **LAMP, Incandescent, single contact type with bayonet socket for use as pilot lamp with Thermo-Regulator No. 13740. Used also as replacements on DeKhotinsky Incubators, Ovens, Sterilizers and Wassermann Baths. Capacity, 0.4 ampere; for use on 6 volts, or, with proper shunt, on higher voltages.....** .50
- Note:**—In ordering replacement lamps for DeKhotinsky devices, it is necessary to give the serial number which will be found on the name plate.
8198. **LAMPS, Incandescent, tungsten filament, Edison base to fit all Edison receptacles and sockets.**
- | No. | A | B |
|-----|-----|-----|
| 4 | 4 | 6 |
| 6 | 6 | 8 |
| .75 | .75 | .85 |
- Each



No. 8200.



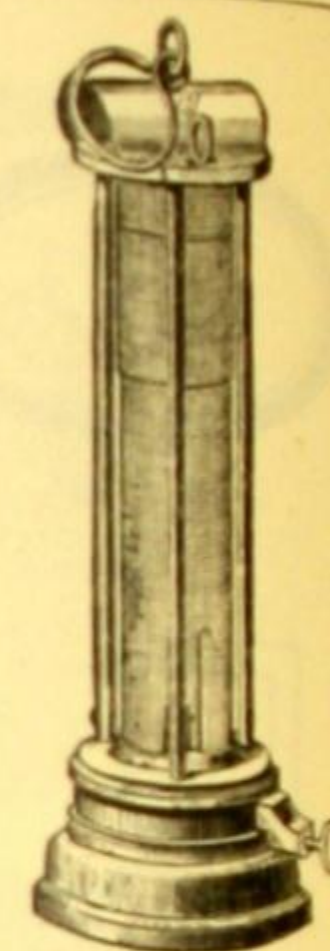
No. 8202.



No. 8211.

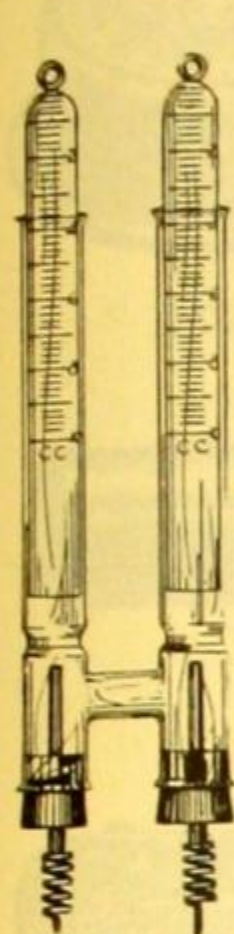


No. 8208.

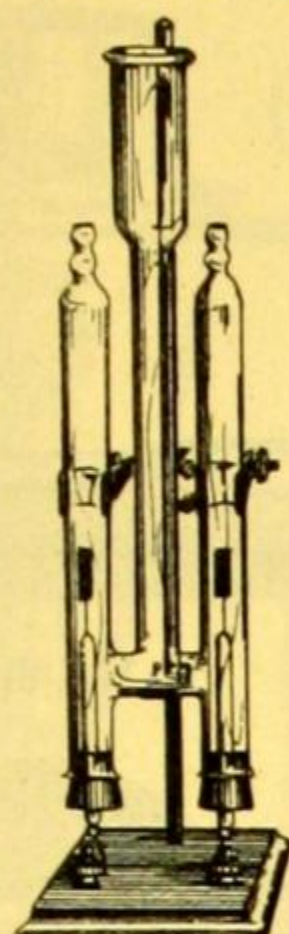


No. 8214.

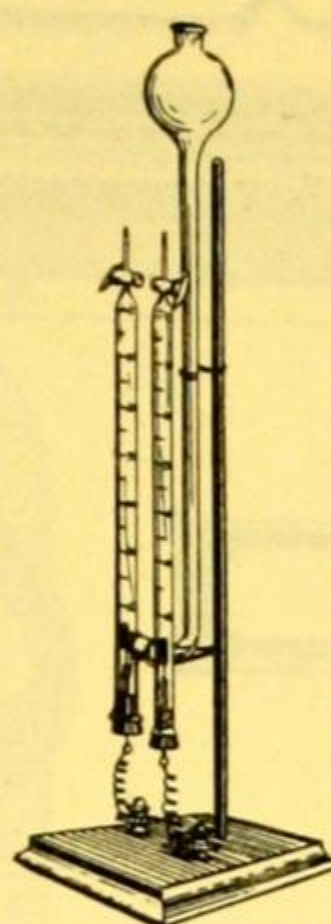
8199. **LAMPS, Incandescent, tungsten filament, for use on other than standard voltages.**
- | | A | B | C | D | E |
|--------------|--------|-----|-----|-----|-----|
| No. | 20 | 25 | 40 | 50 | 75 |
| Voltage | 25 | 25 | 40 | 25 | 25 |
| Wattage | \$0.75 | .75 | .75 | .75 | .75 |
| Each | | | | | |
8200. **LAMPS, Incandescent, carbon filament, 110-volt, Edison base to fit all Edison receptacles and sockets.**
- | | A | B |
|--------------------|-----|-----|
| No. | 16 | 32 |
| Candle power | .25 | .35 |
| Each | | |
8202. **LAMPS, Incandescent, tungsten filament, 110-volt, Edison base to fit all Edison receptacles and sockets.**
- | | B | C |
|-------------|-----|-----|
| No. | 25 | 40 |
| Watts | .45 | .45 |
| Each | | |
8204. **LAMPS, Incandescent, tungsten filament, nitrogen filled, 110-volt, Edison base to fit all Edison receptacles and sockets.**
- | | A | B |
|-------------|-----|------|
| No. | 75 | 100 |
| Watts | .95 | 1.15 |
| Each | | |
8206. **LAMPS, Incandescent, colored glass, carbon filament, 110-volt; natural colors, not dipped; 16 c. p., Edison base to fit all Edison receptacles and sockets.**
- | | B | C | D |
|-------------|------|-------|------|
| No. | blue | green | ruby |
| Color | .60 | .60 | .80 |
| Each | | | |
8208. **LAMP, Pocket Flash, for use in store rooms. Vulcanized fiber case with nickel-plated trimmings.**
Size, $1\frac{1}{2} \times 6\frac{1}{2}$ inches, with tungsten bulb and battery 1.70
8209. **Battery for No. 8208, for replacement.**35
8210. **Incandescent Bulb for No. 8208, for replacement**25
8211. **LAMP, Standard Incandescent, carbon filament, approximately 110 volts, 16 c. p., 64 watts, for stationary use. With certificate of candle power from the Electrical Testing Laboratories. Accuracy of rating, $\frac{1}{4}\%$.** 4.50
8212. **LAMPS, Standard Incandescent, tungsten filament of special construction to obviate variable cooling of filament when it touches its anchor wires. More satisfactory as light standards than carbon filament lamps. With certificate of candle power from the Electrical Testing Laboratories. Accuracy of rating, $\frac{1}{10}\%$. In ordering, specify the voltage at which the lamp should be standardized. This may be between 100 and 130 volts. For stationary use.**
- | | A | B | C |
|-------------|------|------|------|
| No. | 25 | 40 | 50 |
| Watts | 9.00 | 9.00 | 9.00 |
| Each | | | |
8214. **LAMP, DAVY'S SAFETY, as used in mines. Height, about 25 cm.** 4.00
LANTERNS, Projecting, see Catalog F of Physical Apparatus.
LEAD FOIL, see Catalog R of Chemical Apparatus.
8216. **LEAD SHOT for cleaning bottles, etc.**
- | | 6 | 8 | 11 |
|--------------------|-----|-----|-----|
| Size No. | .25 | .25 | .25 |
| Per pound | .85 | .85 | .85 |
| Per 5 pounds | | | |
- F2857. **LEATHER BELTING, Round.**
- | | $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{5}{16}$ |
|------------------------|---------------|---------------|----------------|
| Diameter, inches | .10 | .12 | .20 |
| Per foot | | | |



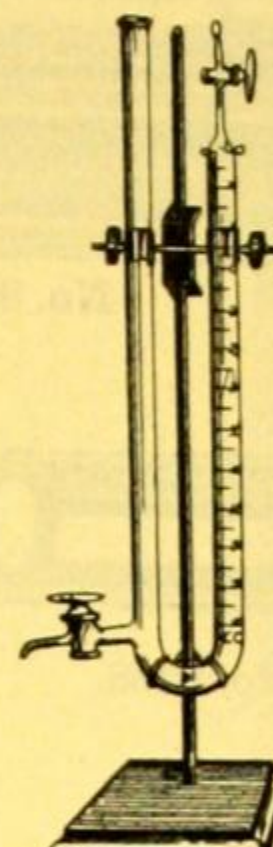
No. 8220.



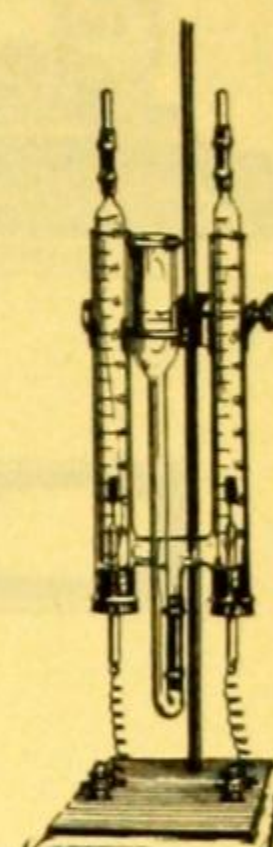
No. 8222.



No. 8234.



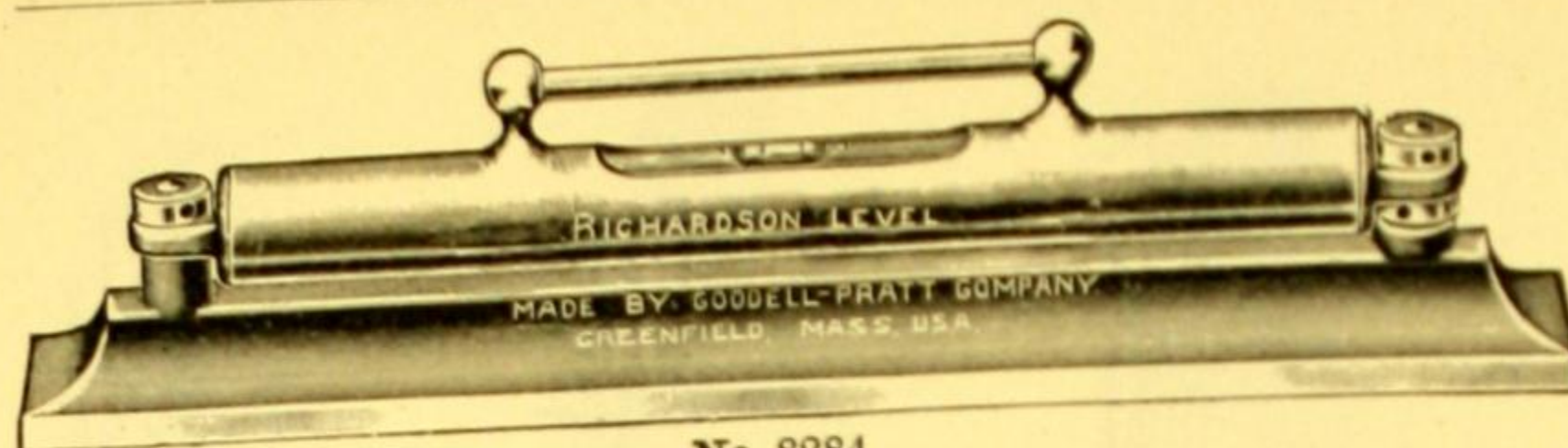
No. 8254.



No. 8268.

LECTURE APPARATUS

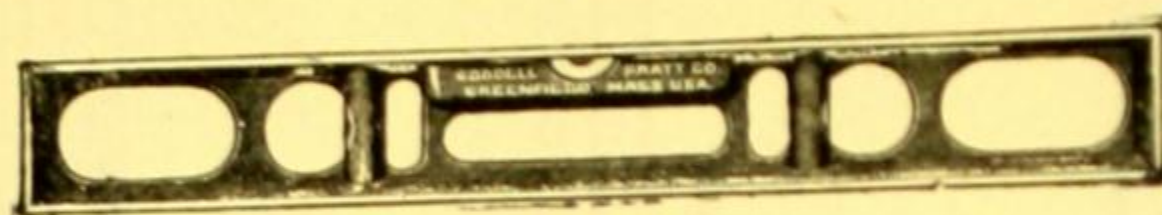
8220. **LECTURE APPARATUS**, for Electrolytic Decomposition of Water, simple form with sliding graduated tubes and removable carbon electrodes \$3.00
8222. **LECTURE APPARATUS** for Electrolysis of Water, improved form, with platinum electrodes that may easily be replaced by copper electrodes or by carbon electrodes for electrolysis of hydrochloric acid. (See Nos. 8238 and 8239.) Complete with support..... 7.25
8224. **Glass Parts** only of No. 8222, without electrodes. (See Nos. 8238-8240)..... 2.00
8234. **LECTURE APPARATUS**, Hoffman's Improved Form, for decomposition of water, with graduated tubes, glass stop-cocks and removable platinum electrodes, complete with support. 15.00
8236. **Glass Parts** only for No. 8234 without electrodes. (See Nos. 8238-8240)..... 10.00
8238. **Carbon Electrodes** for use with Nos. 8220, 8222, 8234 and 8268, consisting of two rubber stoppers fitted with carbon electrodes..... .50
8239. **Copper Electrodes**, same as No. 8238, but with copper instead of carbon electrodes..... .50
8240. **Platinum Electrodes**, same as No. 8238, but with platinum instead of carbon electrodes.. 1.75
8242. **Support Stand** only for Nos. 8222 and 8234 with binding posts..... 3.50
8254. **LECTURE APPARATUS**, Hoffman's Eudiometer, with platinum electrodes, two stop-cocks, and graduated arm. Complete with support..... 13.50
8255. **Glass Parts** only of No. 8254, with platinum electrodes sealed in..... 10.00
8268. **LECTURE APPARATUS**, Osborne's Form, for electrolysis of water and for study of conductivity of liquids, ionization, electro-plating and electrolysis of water. A simple, substantial form of electrolytic apparatus that can be used to demonstrate the principles involved in the theory of electrolytic dissociation. It consists of an outer U tube with graduated sliding tubes, shot valves, glass plug and platinum electrodes, which are easily replaced by carbon or copper electrodes (Nos. 8238 to 8240). It allows immediate change of liquids, permits the introduction of an indicator, cloth for bleaching, is readily cleaned, requires least amount of liquids to fill it. Complete as illustrated, on support with binding posts, with instructions for use 11.75
- 8268A. **Glass Parts** only of No. 8268, without electrodes. (See Nos. 8238-8240)..... 6.00
8270. **Support Stand** only for No. 8268..... 4.00



No. 8284



No. 816.



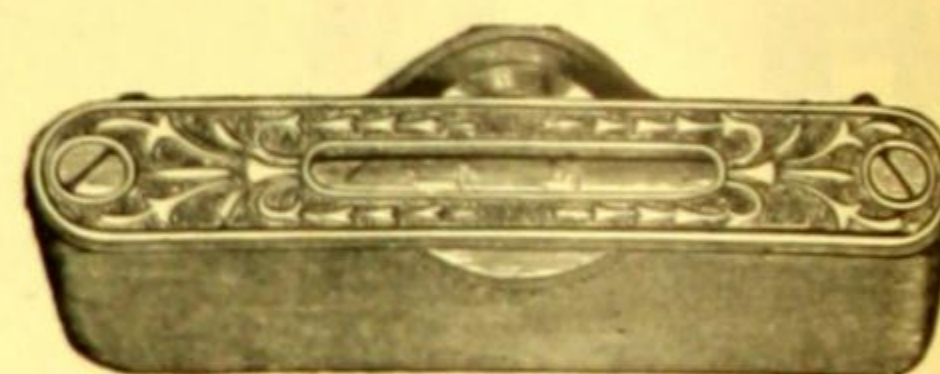
No. 8288.



No. 8292.



No. 8290.



No. 8294.



No. 8296.

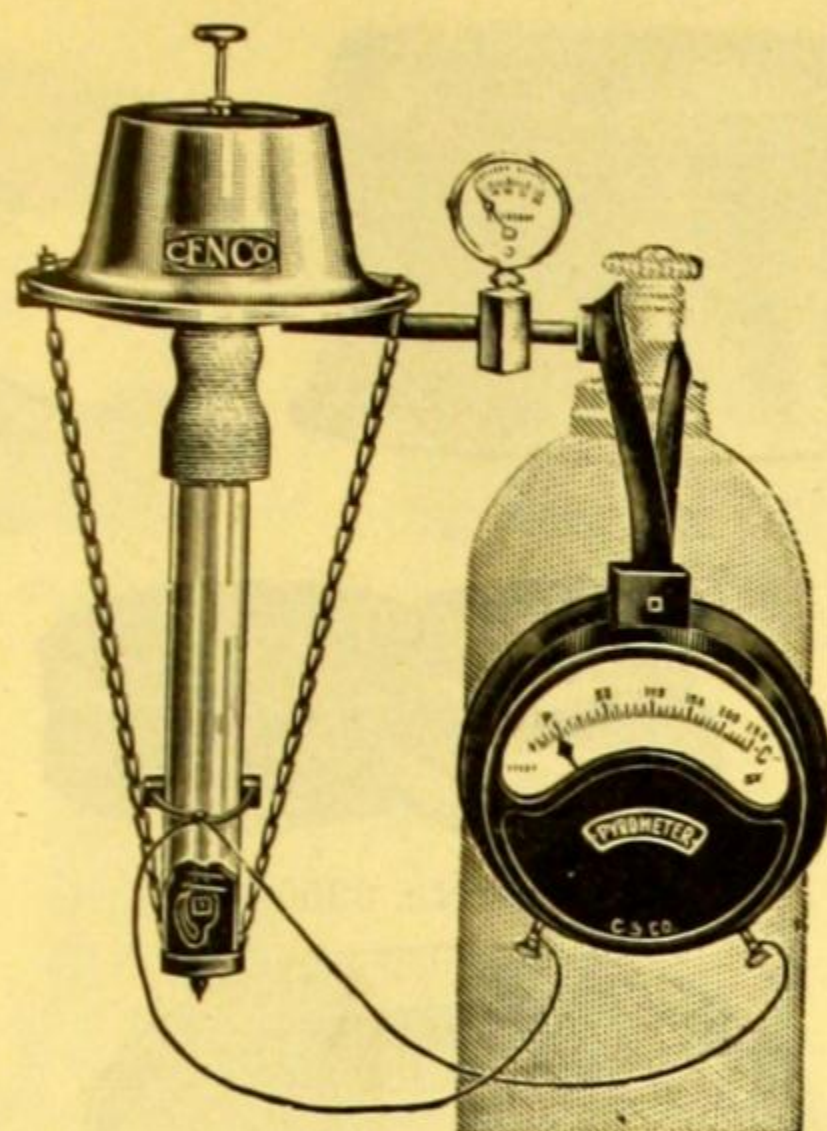


No. F261.



No. 8306.

8276. **LENS PAPER**, Japanese, for cleaning lenses, in sheets 7x11 inches, in packages of 100 sheets.
Per package \$0.40
- LENSES**, Magnifying, see **Magnifiers**.
- LETTERS**, Steel, see **Dies**.
- LEVELING BULBS**, see No. 1902.
8284. **LEVEL**, Bench, Adjustable, with handle and accurately graduated vial. Length, 4 inches; handle and tube nicked, base japanned..... 3.60
8288. **LEVEL**, Mechanics', Iron, 12 inches long, ground face and ends, japanned body, double plumb 3.30
8290. **LEVEL**, Mechanics', Wood, ordinary type; 10 to 16 inches long. Oval top plate, two side views70
8292. **LEVEL**, Pocket, Brass, ground flat on the base, nickel-plated; 2 inches long. Very useful in making apparatus45
8294. **LEVEL**, Pocket, Iron, japanned, 3 1/4 inches long25
816. **LEVEL**, Round, in brass case, for balance cases, drying ovens, incubators, etc. Diameter, 2.5 cm. 6.00
8296. **LEVEL**, Round, "Which Way," of steel, nickel-plated. Diameter, 3.5 cm..... 1.00
- F261. **LEVELING SCREWS**, in sets of three, permitting the rapid leveling of board or glass plate. Made entirely of metal, the base of which is accurately planed. Base japanned, screw white nickel-plated. Height, 7.5 cm; range of adjustment, 13 mm.....per set 3.00
8306. **LIBRARY PASTE**, best grade.
- | | | |
|-------------|------------------|-----------------------|
| No. | A | B |
| Style | Collapsible Tube | 3-Ounce Screw-Cap Jar |
| Each | .15 | .20 |



No. 8320 (Shown With Nos. 8321 and 8322).

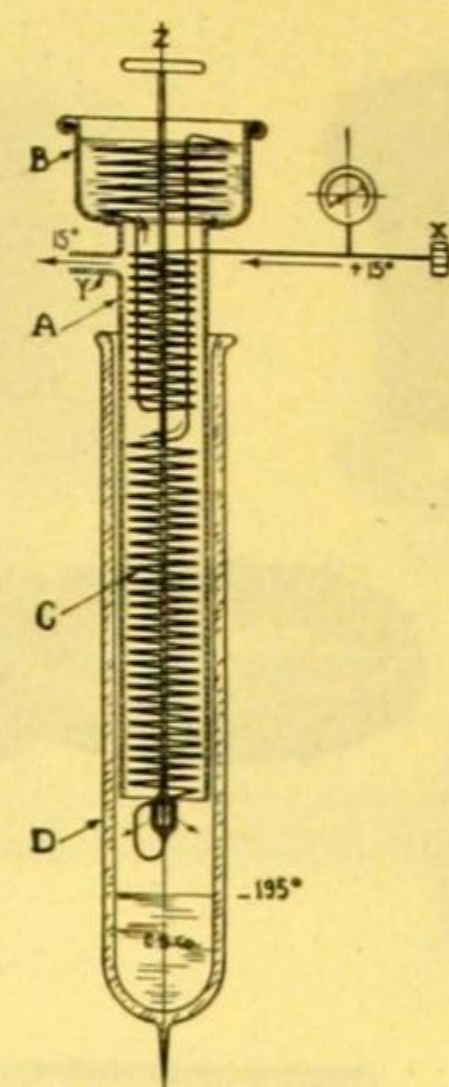


Diagram Showing Internal Construction.

8320. **LIQUID AIR, Apparatus for Producing.** Many interesting experiments that can be performed with the liquefied gases (so-called permanent gases), have not been possible in most laboratories because the liquefied gases could not be procured. This apparatus permits the production of liquid air or oxygen on a laboratory scale at comparatively low expense, since it requires no expensive compressors or purifying apparatus. At the same time, it gives visual demonstration of the production of the liquid gas by the Linde process which has heretofore not been possible in more than a very few laboratories.

In using this apparatus, the simplest plan for the ordinary laboratory is to purchase a steel drum containing air or oxygen at approximately 200 atmospheres pressure. The gas so purchased is free from moisture and carbon dioxide. The liquifying unit is coupled to the steel drum by means of a standard coupling. The whole unit is shown diagrammatically in the illustration. A Dewar flask, which may be unsilvered if the actual production of the liquid is to be visible, is slipped over the copper tubing and is supported by a rubber sleeve, which also renders the connection gas tight. Gas entering the tubing at 200 atmospheres travels as indicated until it reaches the needle valve at the lower end of the coil. There expansion takes place and the expanded gas flows upward around the tubing, cooling the latter and escaping at the outlet Y. For greater efficiency, the upper vessel B may be filled with a freezing mixture. Cooling is progressive and if oxygen is used the liquid begins to form after three to four minutes. The needle valve is operated by means of the handle Z, which protrudes above the cooling vessel. Approximately one-half liter per hour can be obtained so that in the course of one or two hours enough of the liquid oxygen or air can be accumulated for most of the well known experiments \$90.00

8321. **Dewar Tube**, for use with No. 8320, special form with mirror removed from a strip down the side to permit observation of the process of liquefaction. A thermocouple is sealed in the tube, which when connected to No. 8322 Pyrometer listed below, enables the temperature of the contents to be noted..... 15.00
8322. **Pyrometer**, for use with Nos. 8320 and 8321. With scale reading from 20° to -200° C. 40.00

CENCO CERTIFIED CHEMICALS

CATALOG R of Chemicals contains a complete list of all reagent and commercial chemicals used in laboratory work. In addition it lists a complete line of bacteriological stains and reagents, indicators for H-ion work, rare sugars and mineral specimens. It is a complete alphabetical index of laboratory chemicals. In accordance with our custom on all laboratory supplies, these chemicals are carried in stock in large quantities for immediate shipment.

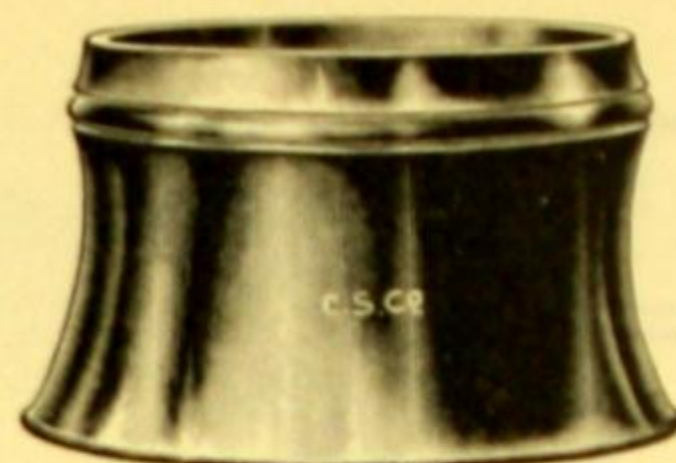
We invite special attention to our line of **CENCO CERTIFIED CHEMICALS**, which are analyzed in our own laboratory and upon which definite limits of impurities have been established, with which all chemicals sent out are guaranteed to conform. These limits of impurities are contained in our Bulletin No. 101, a copy of which, together with **CATALOG R**, will be sent once upon request.



No. 8342.



No. 8343.



No. 8344.



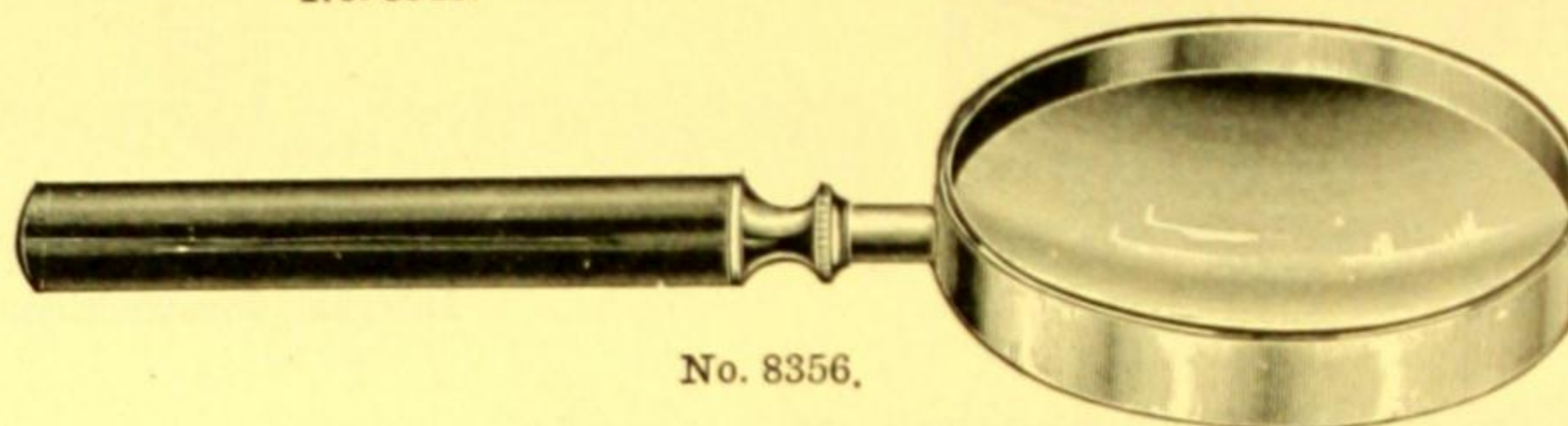
No. 8346B.



No. 8348.



No. 8350.



No. 8356.

MAGNIFIERS

8342. **MAGNIFIERS, Doublet**, consisting of two plano convex lenses in a metal mount, for use either as a hand magnifier or in dissecting microscopes.

No.	A	B	C
Magnifying power, diameters.....	6	9	12
Focal distance, mm.....	41.6	27.8	20.8
Working distance, mm.....	22	15	12
Diameter real field, mm.....	22	16	11
Each	\$1.75	1.75	1.75

8343. **MAGNIFIERS, Doublet**, consisting of two plano convex lenses mounted in folding pocket case.

No.	A	B	C
Magnifying power, diameters.....	6	9	12
Focal distance, mm.....	41.6	27.8	20.8
Working distance, mm.....	22	15	12
Diameter real field, mm.....	22	16	11
Each	2.00	2.00	2.00

Note:—10% discount to educational institutions from list prices of Nos. 8342 and 8343.

8344. **MAGNIFIER, Counting Glass**, for use in counting colonies of bacteria in the Koch method for water and milk. This glass meets the specifications of the American Public Health Association. Magnification, $3\frac{1}{2}x$. (See Standard Methods of Bacteriological Analysis of Water and Milk, of the A. P. H. A.)..... 4.00

- 8346B. **MAGNIFIER, Linen Tester**, extensively used in elementary biology work, and for various other purposes where a small compact magnifier is desired. Folds up into very small space. Magnifies 10 diameters. Diameter of opening, $\frac{1}{2}$ inch50

8348. **MAGNIFIERS, Pocket**, in folding mount of rubber, very light and durable.

No.	A	B
Diameter of lens, mm.....	18	30
Magnifying power, diameters.....	5	3.5
Each	.65	.85

8350. **MAGNIFIERS, Pocket**, same as No. 8348, but with double lens.

No.	A	B
Diameter of lenses, mm.....	15, 20	25, 30
Magnifying power, diameters.....	5-12	3.5-8
Each	.85	1.25

8352. **MAGNIFIERS, Pocket**, same as No. 8350, but with triple lens.

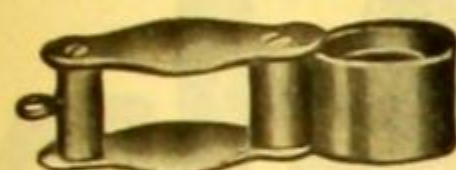
No.	A
Diameter of lenses, mm.....	12, 15, 18
Magnifying power, diameters.....	7-30
Each	1.25

8356. **MAGNIFIERS, Reading Glasses**, with nicked rim and ferrule, and with black wooden handle.

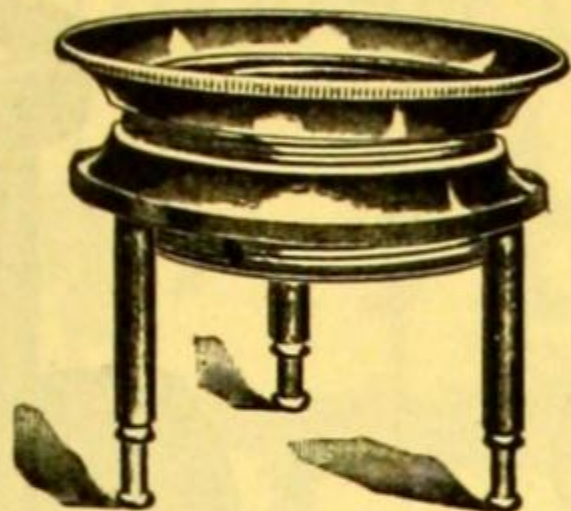
No.	A	B	C	D
Diameter of lens, inches.....	2	$2\frac{1}{2}$	3	4
Focus, inches	5	6	7	10
Each	.80	1.00	1.20	2.00



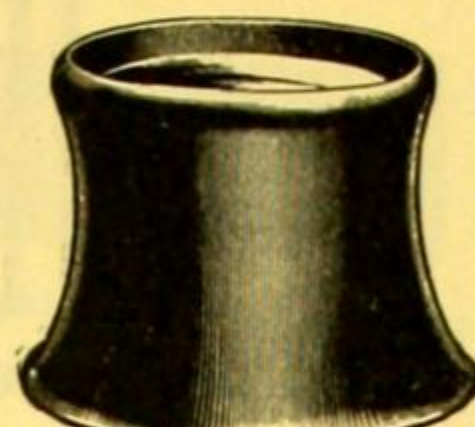
No. 8360.



No. 8361.



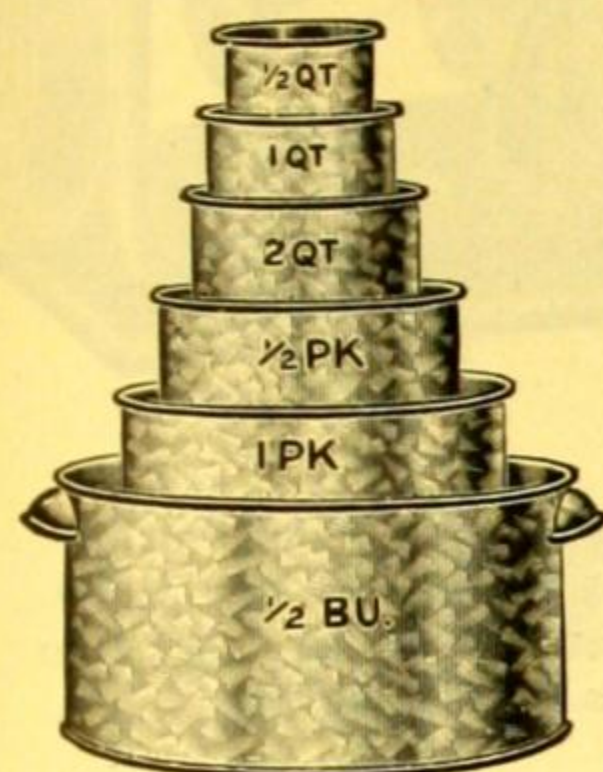
No. 8364.



No. 8366.



No. 8368.



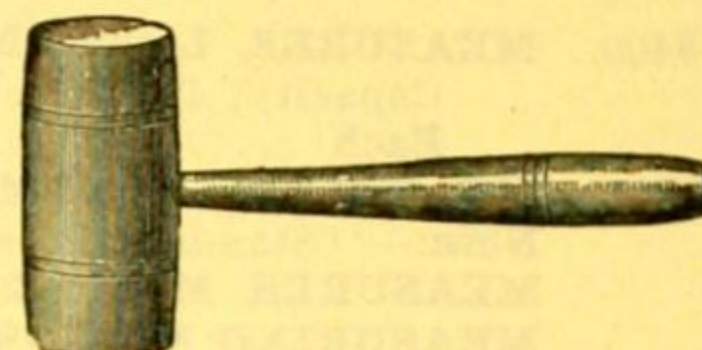
No. 8391.



No. 8386.



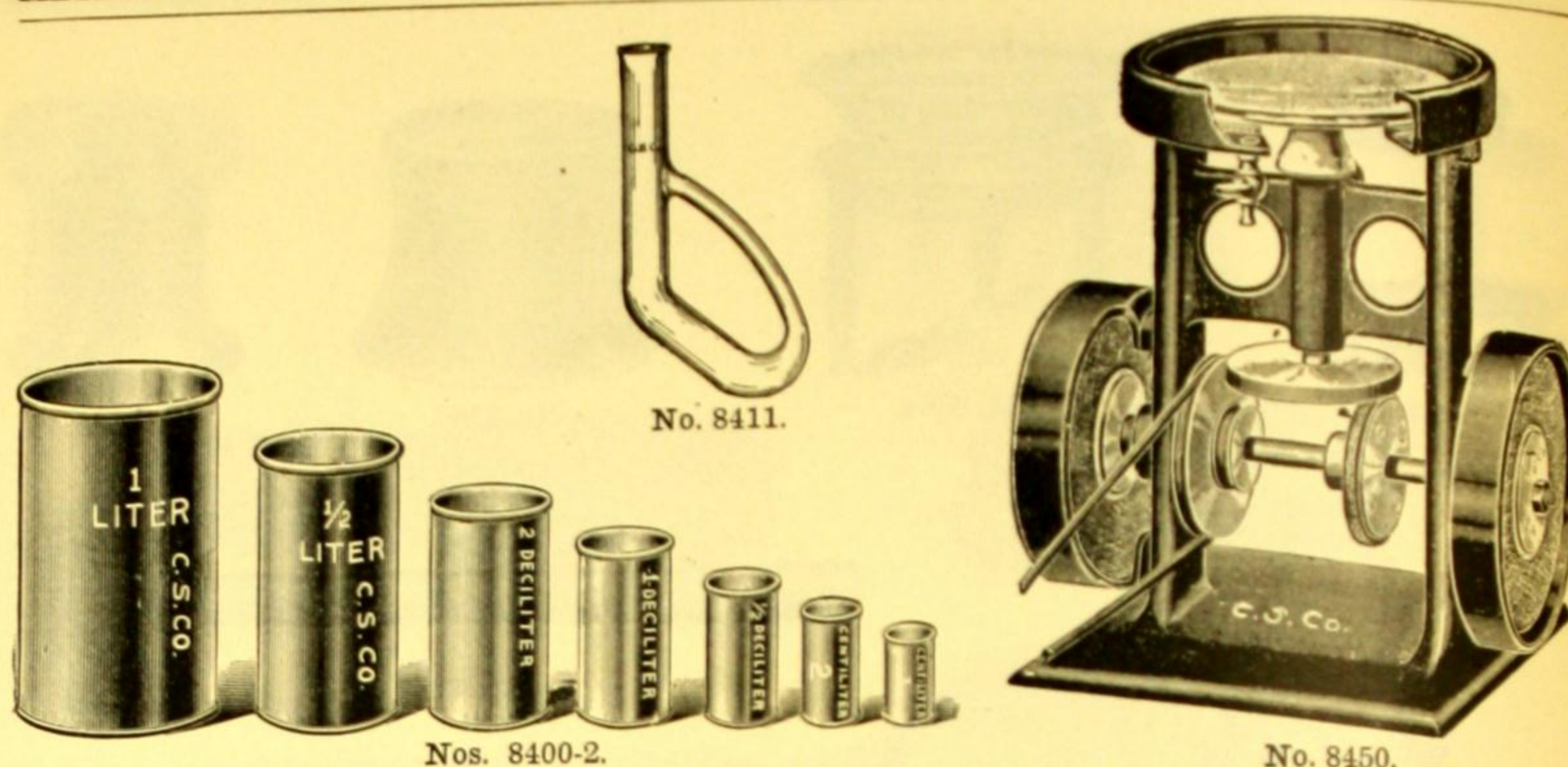
Nos. 8394-6.



No. 8378.

MAGNIFIERS, Triple Aplanat, the highest type of hand or dissecting magnifier. They are perfectly achromatic and free from distortion, have an extra long working distance, and furnish an unusually large, flat field.

	No.	A	B
	Magnifying power, diameters.....	9	12
	Focal distance, mm.....	27.8	20.8
	Working distance, mm.....	24.5	18.4
	Diameter real field, mm.....	20	15
8360.	Mounted for use in dissecting microscopes.....	\$4.75	4.75
8361.	Mounted in folding case for hand use.....	5.00	5.00
	10% discount to educational institutions from list prices of Nos. 8360 and 8361.		
8364.	MAGNIFIER, Tripod, giving a large, clear field and sufficient magnifying power for elementary botanical and zoological studies. The lens is focused by screwing up or down in the metal frame		.80
8366.	MAGNIFIER, Watchmakers' Glass, double convex lens in vulcanite mounting. Diameter, 25 mm; magnifying power, 3 to 5 diameters.....		.90
8368.	MAGNIFIER, Watchmakers' Glass, consisting of two lenses of 12 and 25 mm diameter. The front lens (12 mm) can be removed by unscrewing, thus permitting the use of the rear lens (25 mm). Magnifying powers, 4 and 7 diameters		1.50
8372.	MAILING TUBES, heavy pasteboard, 1½x12 inches	Per dozen	.35
	For other MAILING TUBES, see Nos. 5988 and 5989 Sample Mailing Cases.		
8378.	MALLET, Wood, round, 3-inch face.....		.45
	MANOMETERS, see Gages.		
8382.	MATCHES, Swedish Safety, in packages of 12 boxes	Per package	.16
		Per 12 packages	1.70
	MATRASSES, see Blowpipe Apparatus.		
8386.	MAUL, of iron, with wooden face and hickory handle. Length of handle, 2 feet; diameter of head, 3½ inches; weight, 6 pounds.....		1.80
	MEASURES, Calipers, see Calipers.		
8391.	MEASURES, Dry, Galvanized Iron, with reinforced rim. Set of 5 pieces, 1, 2 and 4 quarts, 1 peck and ½ bushel.....		3.70
8394.	MEASURES, Liquid, Polished Copper, tinned inside, with spout and handle.		
	Capacity, pints	1 2 8	
	Each	2.00 2.75 4.75	
8396.	MEASURES, Liquid, Tinned Iron, with spout and handle.		
	Capacity, pints.....	½ 1 2 4 8	
	Each	.20 .22 .25 .30 .50	
8397.	MEASURES, Liquid, Tinned Iron. Set of 5 pieces, consisting of one each of those listed under No. 8396		1.45

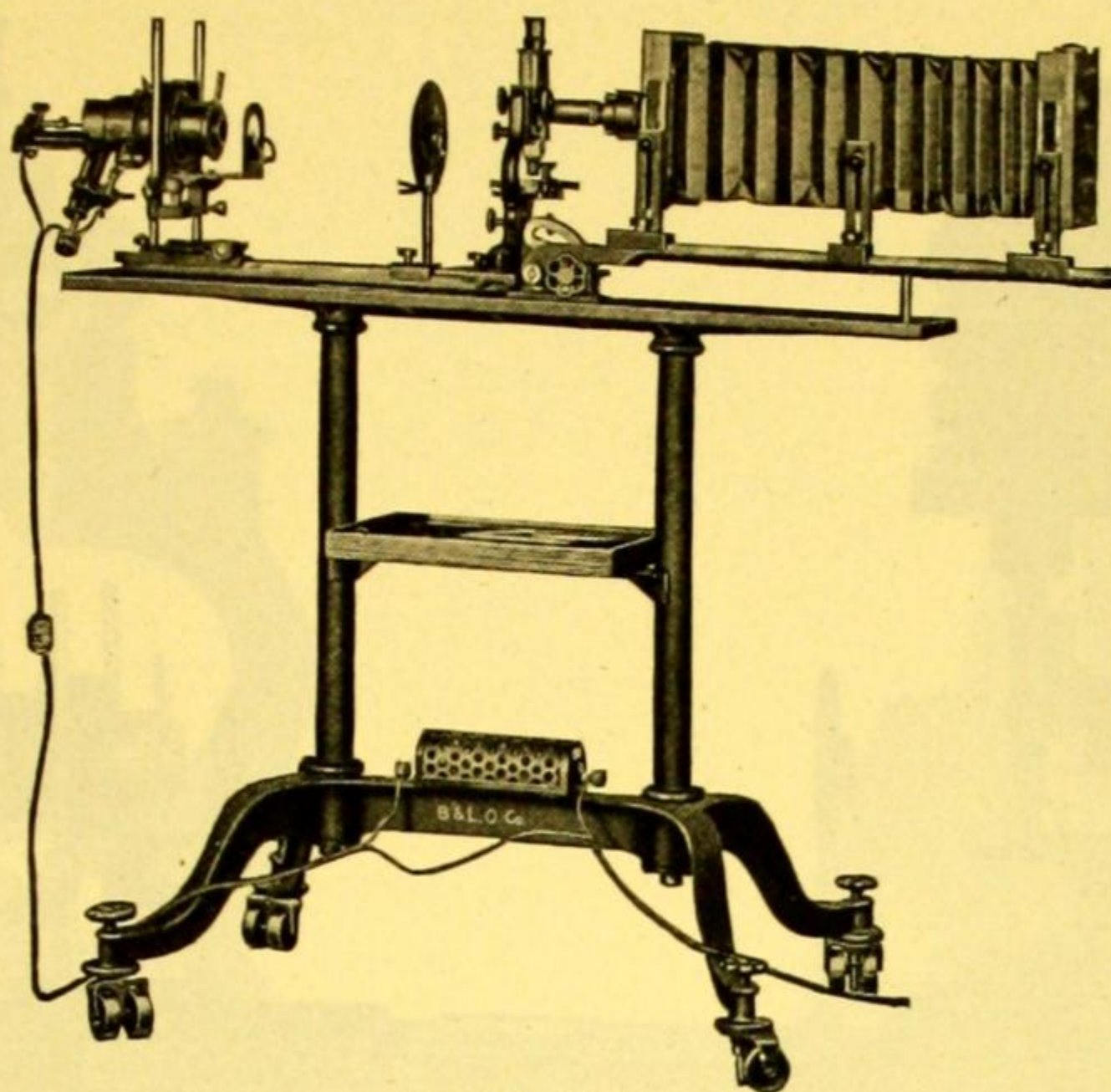


8400. MEASURES, Liquid, Metric, polished brass, standard form.
Capacity, liters 0.01 0.02 0.05 0.1 0.2 0.5 1
Each \$0.40 .50 .55 .60 .80 1.20 1.30
8402. MEASURES, Liquid, Metric. Same as No. 8400. Set of seven pieces, 0.01 liter to 1 liter 5.25
Note:—"Standard Form" is that in which the diameter equals half the height.
MEASURES, Metric Rules, see Scales.
MEASURING MICROSCOPE, see Microscopes.
MECHANICAL STAGE, see Microscope Accessories.
8411. MELTING POINT TUBES, Thiele, modified by Dennis, of Pyrex glass..... 1.40
MERCURY BULBS, see No. 1902.
METABOLISM APPARATUS, see page 533.

METALLOGRAPHIC APPARATUS

- BLAST, Hot Air for drying freshly polished specimens, see No. 1388.
DESICCATOR CABINET for storing polished specimens, see No. 3790.
FURNACES for heat treating, see general heading Furnaces.
5162. EMERY PAPERS, Metallographic, French grade, specially prepared for Metallographic purposes.
No. 0000 000 00 0 1
Per sheet06 .05 .05 .05 .05
Per quire 1.20 1.00 1.00 1.00 1.00
8450. GRINDING AND POLISHING MACHINE, Wysor, for rough grinding, fine grinding and polishing metal specimens. The machine consists of two wheels of carborundum for grinding, one coarse and one fine, mounted on a horizontal shaft; and a vertical spindle, operated by means of a friction drive off the horizontal shaft, for the replaceable polishing disks. The speed of the polishing spindle may be varied by shifting the friction wheel on the shaft. Three polishing disks are supplied; one covered with canvas, to be used with emery flour for preliminary polishing, the other two covered with broadcloth for use with tripoli powder and jeweler's rouge for finished polishing. Complete with three polishing disks, without motor 78.50
8451. GRINDING AND POLISHING MACHINE, Wysor, same as above, but mounted on a cast iron base with 1/8 h. p. motor.
No. A B C D
For volts A.C. D.C.
Each 110 220 110 220
130.00 132.50 122.50 125.00
- Parts and Accessories for Nos. 8450-8451.
8452. Extra Polishing Cloths, set of five..... .50
8453. Grinding Wheel, Carborundum, Coarse, 6 inches diameter, 3/4 inch thick, with 1/2 inch hole. 3.25
8454. Grinding Wheel, Carborundum, Medium, 6 inches diameter, 3/8 inch thick, with 1/2 inch hole. 2.50
8455. Grinding Wheel, Carborundum, Fine, 6 inches diameter, 3/8 inch thick, with 1/2 inch hole. 2.50
- HARDNESS TESTING APPARATUS, see general heading Hardness Testers.
8498. LEVIGATED ALUMINA for use with No. 8450, specially prepared for obtaining a correct and rapid finish; in powder form.
No. A B C
For use with steel and hard medium hard soft
metals metals metals
Per ounce 1.00 1.40 1.80

METALLOGRAPHIC APPARATUS, Continued.



No. 8500.

METALLOGRAPHIC OUTFIT, Bausch and Lomb LA7-FSMT9, a very convenient apparatus for metallographic work, as one can look down through the microscope in the regular way when visually examining the specimen, and then, by sliding in the supplementary draw tube, can cause the image to be projected into the camera ground glass. The camera may be used in a vertical position if desired, in which case the microscope base plate would be placed parallel with the optical bed and the side tube used for direct observation. The outfit is equipped for use with high-power objectives for magnifications from 24 to 500 (at minimum bellows extension).

Note:—Arc illumination is recommended for general metallurgical work inasmuch as it produces the greatest light intensity. Since the arc is not satisfactory on A.C. circuits on account of its tendency to flicker, the Tungsare lamp is recommended for general work, although it necessitates about six times the exposure of the carbon arc. The Tungsare may be obtained with controlling resistance for 110 volts D.C. or with special rectifier for 110 volts A.C. For use at low and medium magnifications, up to 500x (8 mm objective), the 6 volt, 18 ampere, 108-watt Mazda lamp is recommended, and may be obtained with transformer for A.C. circuits and with resistance for D.C. circuits.

Specifications.

Microscope FSMT9. Designed especially for use in metallography. Equipped with supplementary tube which contains a sliding inner tube fitted with a 90° prism so that when this is pushed into position the beam of light is intercepted and directed in a horizontal direction. Because of this arrangement, the object may be observed directly through the microscope, while for photographing, the use of a horizontal camera is made possible. Supplied with 32, 16 and 4 mm objectives, two each 6.4x and 10x eyepieces, vertical illuminator and mechanical stage.

Illuminating System. Consists of a 4½ ampere, 90° hand feed arc lamp with rheostat for 110 volts; aspheric condenser; support for ray filter; one ground glass, one blue glass and one green glass filter; and a supplementary condenser with iris diaphragm and light shield, on adjustable support, to work in conjunction with aspheric condenser and vertical illuminator.

Supporting Stand. Of cast iron; feet of stand have lateral spread of 25 inches; top plate, carrying camera bed and optical bed for illuminating accessories and microscope plate is 45x7¾ inches and 39 inches from the floor; shelf, 12x15 inches, is mounted between the standards for holding accessories.

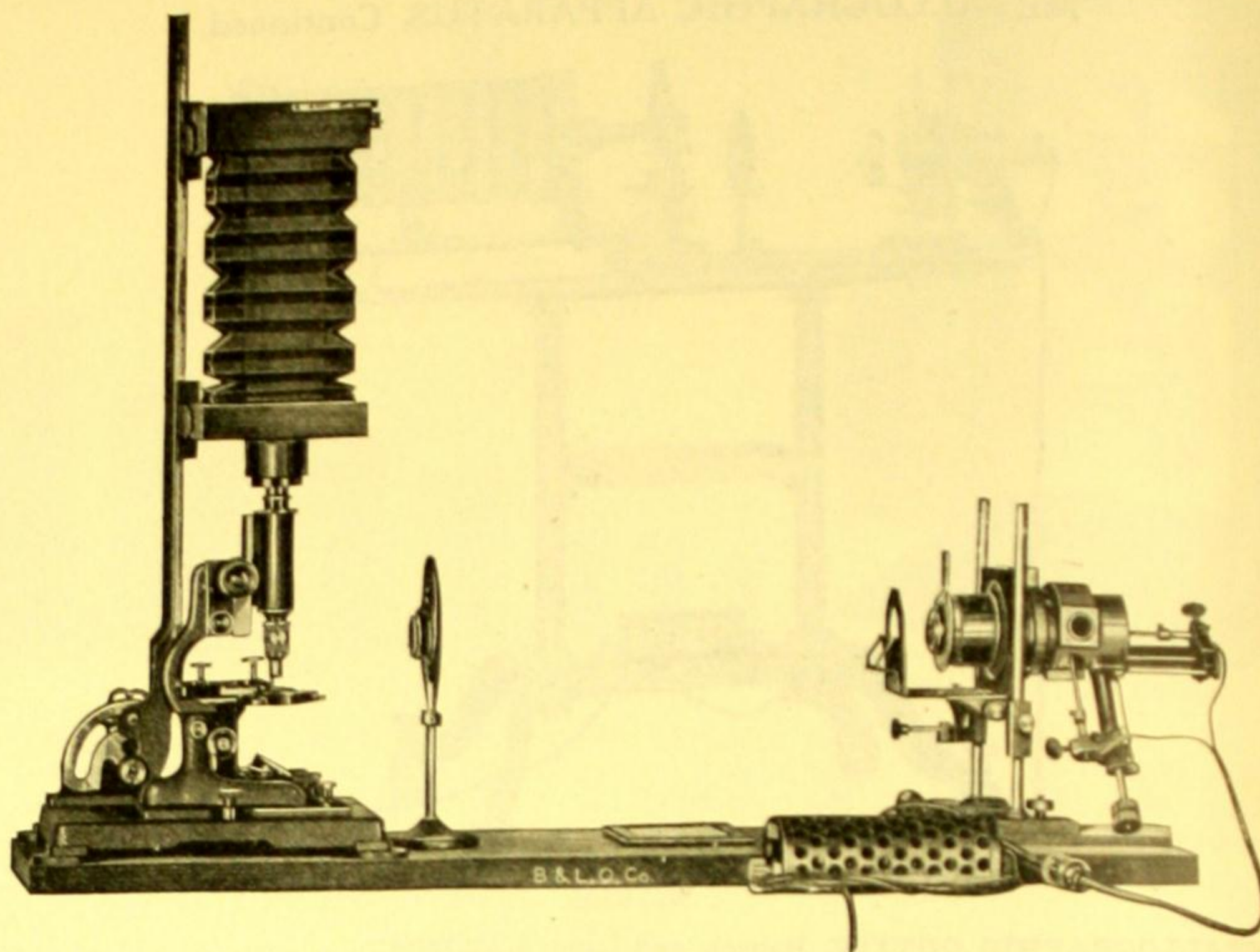
Camera. Optical bed 25 inches long, graduated to 60 cm with inclination joint, wooden frames, bellows, ground glass and one double plate holder for 5x7 plates; wooden frames attached to two supports on optical bed, upon which they are adjustable to bring center of camera into alignment with microscope; fitted with automatic shutter and light-tight connector for microscope.

8500. **METALLOGRAPHIC OUTFIT, LA7-FSMT9**, complete as described.....\$566.00

For other **ILLUMINATING SYSTEMS** for use with the Metallographic outfit, see note above.

Note:—Objectives included in the above outfit are in regular sized mounts except the 32 mm, which is in short mount. If other objectives are desired in short mounts add \$3.50 for each objective to the above prices. The 4 mm objective is especially corrected for uncovered objects.

Note:—10% discount to educational institutions from list price of No. 8500.



No. 8504.

METALLOGRAPHIC OUTFIT, Bausch and Lomb RSA5-FSM9, a moderate priced outfit for any type of metallographic work. With base consisting of a heavy board, 12x45 inches, instead of iron stand.

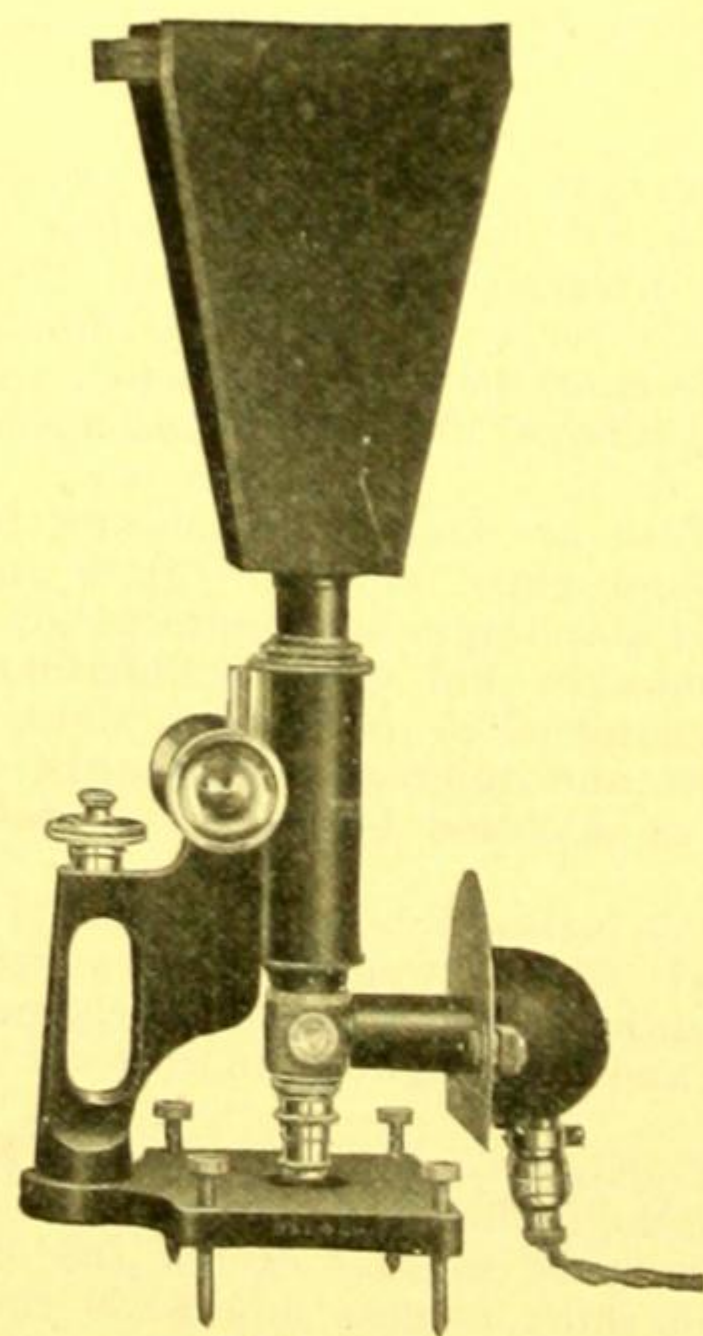
Specifications

Microscope FSM9. The same type of instrument described under outfit LA7, but without 90° supplementary tube.

Illuminating System. Same as in LA7, described under No. 8500.

Camera. Consists of a heavy iron base, 10x12½ inches, secured in position on base board by brackets, sliding microscope plate with clamps, camera bed 25 inches long, graduated to 60 cm with inclination joint, supporting standards, bellows, frames, bellows front board with light-tight connector for microscopes, 4x5 inches, double plate holder and ground glass focusing screen.

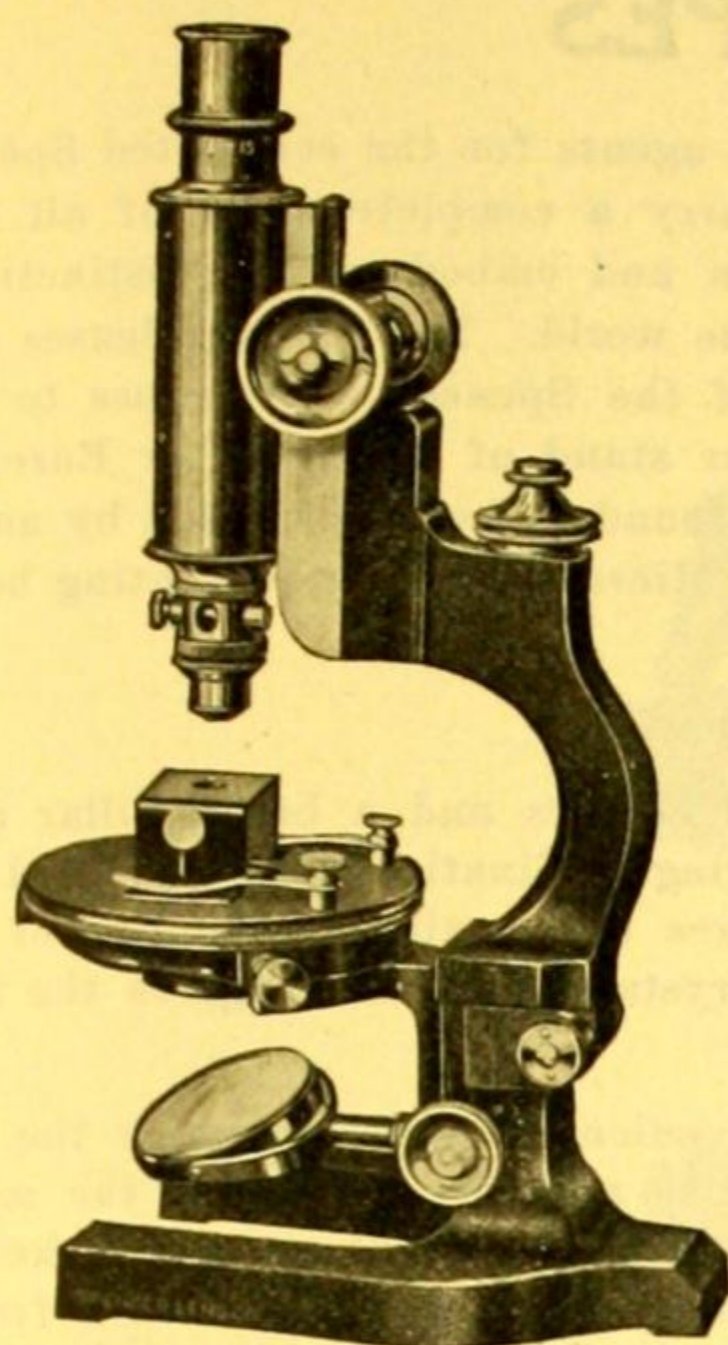
8504. **METALLOGRAPHIC OUTFIT, RSA5-FSM9**, complete as described\$434.00



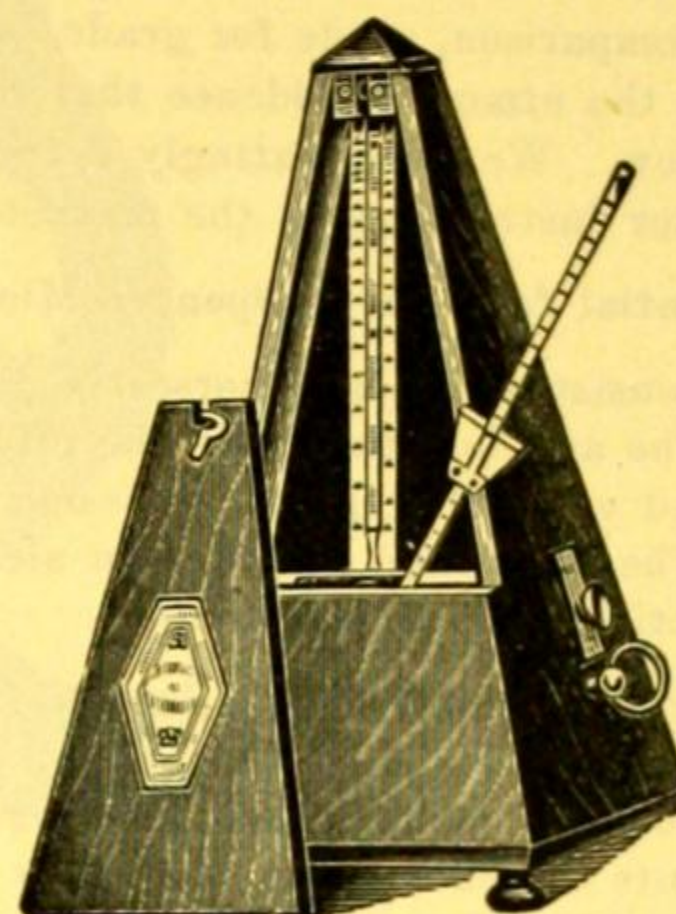
No. 8506.

8506. **METALLOGRAPHIC OUTFIT, Bausch and Lomb (Tassin)**, for photography at low or medium magnifications, primarily designed as an outfit that may be carried into the shop for examinations of large castings. The microscope stage is fitted with four leveling screws which serve as the supporting base. The illuminating system consists of a 15 watt, 120 volt Mazda lamp, mounted in a hemispherical hood, with light shield, which attaches to the vertical illuminator by means of a side tube with condensing lens system. The camera, which is supplied with a focusing ground glass screen and double plate holder for 3½x3½ inch plates, is attached to the microscope by removing the regular draw tube and substituting one permanently attached to the camera. Complete as described, with microscope including 32, 16 and 8 mm objectives, 7.5x eyepiece, and vertical illuminator with side tube and condenser; camera; illuminating system and 20 feet of connecting cord. 125.00

Note:—10% discount to educational institutions from list prices of Nos. 8504 and 8506.



No. 8508.



No. F781.

8508. **METALLURGICAL MICROSCOPE, Spencer No. 47.** Designed for metallurgical work, but can be used in any other opaque work requiring illumination by reflected light. This microscope has coarse and fine adjustments; revolving stage 120 mm in diameter, adjustable vertically by rack-and-pinion through a range of 45 mm, or may be removed entirely from the instrument for the examination of large specimens; a prism type vertical illuminator, No. 8652; and a special frame for holding specimens upon the stage so that the polished surface is perpendicular to the axis of the microscope. The objectives are in special short mounts, corrected for use without cover glasses. Microscope No. 47L provides for magnifications from 25 to 450. Furnished in hardwood cabinet, with lock and key.

No.	47A	47C	47L
Objectives, equivalent focus mm.".....	16, 4	16, 4	32, 16, 4
Achromatic oculars	10x	6x, 10x	6x, 10x
Each	\$108.75	111.00	117.00

10% discount to educational institutions.

Note:—Vertical illuminator No. 8654 with attached electric lamp and adjustable condensing tube can be supplied, if desired, at an additional charge.

PYROMETERS, see general heading **Pyrometers.**

For **Meteorological Instruments,** see **Anemometers, Barometers, Gages, Hygrometers, Sunshine Recorders, Thermometers and Weather Instruments.**

METERS, Gas, see Nos. 6786 and 6953.

- F781. **METRONOME,** for counting seconds and fractional parts of a second, etc. In fine mahogany case 6.75
- F782. **METRONOME.** Same as No. F781, but with adjustable bell attachment. The bell may be made to strike every second beat, third beat, fourth beat or sixth beat..... 9.00
- F783. **METRONOME,** with electrical connection. No. F781 Metronome fitted with mercury cups and binding posts for tracing time on a revolving drum in connection with a time marker. Makes contact at each beat of the pendulum..... 25.00

MICROSCOPES

We desire to advise our friends and patrons that we are agents for the celebrated Spencer Microscopes, manufactured by the Spencer Lens Company, and carry a complete stock of all microscopes listed herein. The Spencer Microscopes are of modern design and embody many distinctive features not found in microscopes from any other manufacturer in the world. The Spencer lenses are guaranteed against all defects. We will be glad to send any one of the Spencer microscopes to responsible persons for comparison, grade for grade, with any objective or stand of American or European manufacture, with the utmost confidence that the Spencer will be found to be unsurpassed by any and only equaled by few. We unhesitatingly recommend the Spencer Microscopes as representing better values than any other instrument on the market.

The essential features of Spencer Microscopes are as follows:

The Stands consist of a heavy horseshoe base having rounded corners and a broad pillar cast in one piece. The arm is attached to the pillar by a double-bearing inclination-joint provided with horizontal and vertical stops. The design of the stands insures the maximum stability of the microscope. The stand and arm has an alcohol proof, black crystal finish, which gives the instruments an attractive, finished appearance.

The Arms are of the curved type forming a graceful and convenient handle by which the instrument may be grasped with the whole hand. The wide curve is so arranged to enable the manipulation of large objects on the stage and yet not be an inconvenience to the laboratory worker. The fine adjustments are enclosed in the upper part of the arm so as to be fully protected from dust or other injury.

The Body Tubes are standard, taking the objectives with the standard Society screw and standard oculars. They are fitted with graduated draw tubes with scale divided into millimeters, numbered at each centimeter division to facilitate rapid setting of the correct tube length.

The Fine Adjustments are of three types, which are distinctive of the Spencer Microscopes.

The most refined type is the type B which is used on Microscopes No. 8528, 8529, 8546 and 8548. This is a side fine adjustment, conveniently located to be operated by either hand, with a graduated drum on the right-hand knurled head to indicate the amount of vertical motion, one complete revolution giving an up and down movement of $1/10$ mm, the graduations reading to single microns (.001 mm). There is absolutely no lost motion in this fine adjustment.

The regular side fine adjustment supplied with microscopes No. 8532 and 8536, is the type D adjustment. It has but two bearing surfaces and three working parts. The patented one-piece construction bearing carries a solid steel screw. This screw, with no less than twenty threads engaged even at the limit of its motion, has a heavy flange F working against a lever L. When the screw is turned in such a direction as to carry F forward, the lever is so swung as to raise the body tube. The reverse motion permits the tube to be lowered under the influence of the spring. The focusing buttons at either end of this screw travel laterally and serve as a visible index of the center of the fine adjustment action. Steel pins in the heads form positive stops at either end of the excursion. The direction in focusing is the same with both fine and coarse adjustments. One revolution moves the tube 0.2 mm.

The older type of top fine adjustment is called type C. It is sufficiently sensitive and accurate to be very suitable for student work. One revolution moves the body tube 0.5 mm. It has an additional advantage for student work in that the action ceases to work when the objective comes in contact with the slide.

The Objectives, as are the oculars, are made from optical glass especially manufactured from a highly perfected formula by the Spencer Lens Co. and will not deteriorate under any influences of climate or atmosphere. The lenses are mounted directly into the metal of the mounting and are thus unharmed when cleaned with a solvent. The objectives are corrected for a tube length of 160 mm and for a cover glass thickness of 1.8 mm (No. 2 cover slip). High power dry objectives cannot be expected to show their best qualities except under the above conditions. The correct tube length is of the utmost importance with a homogeneous oil immersion objective. The 4 mm objective which is the most commonly used has a working distance of .46 mm, which is .13 mm greater than that of some other makes. All objectives are made with the Society screw.

The Oculars and Condensers are made to fit the standards adopted by the Royal Microscopical Society.

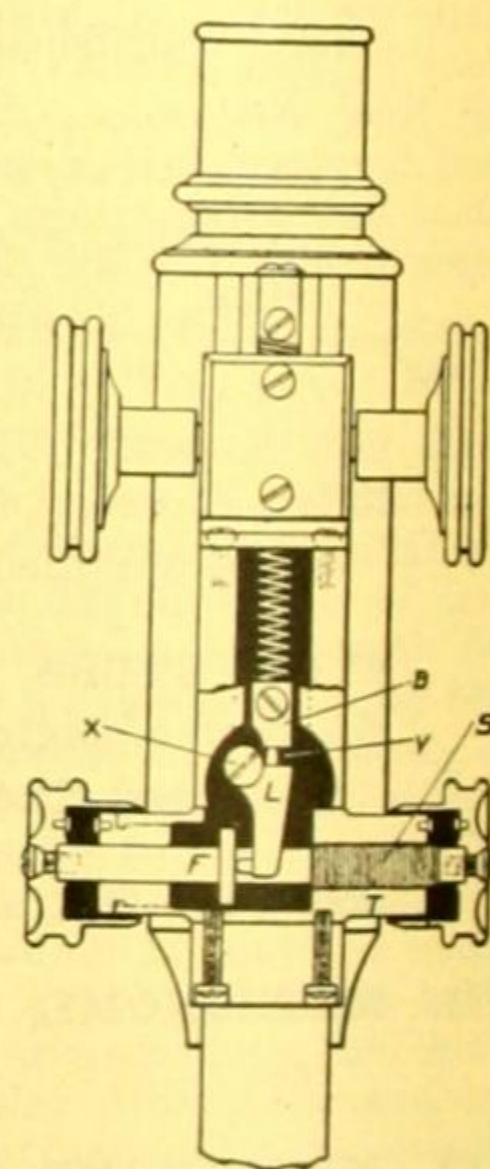
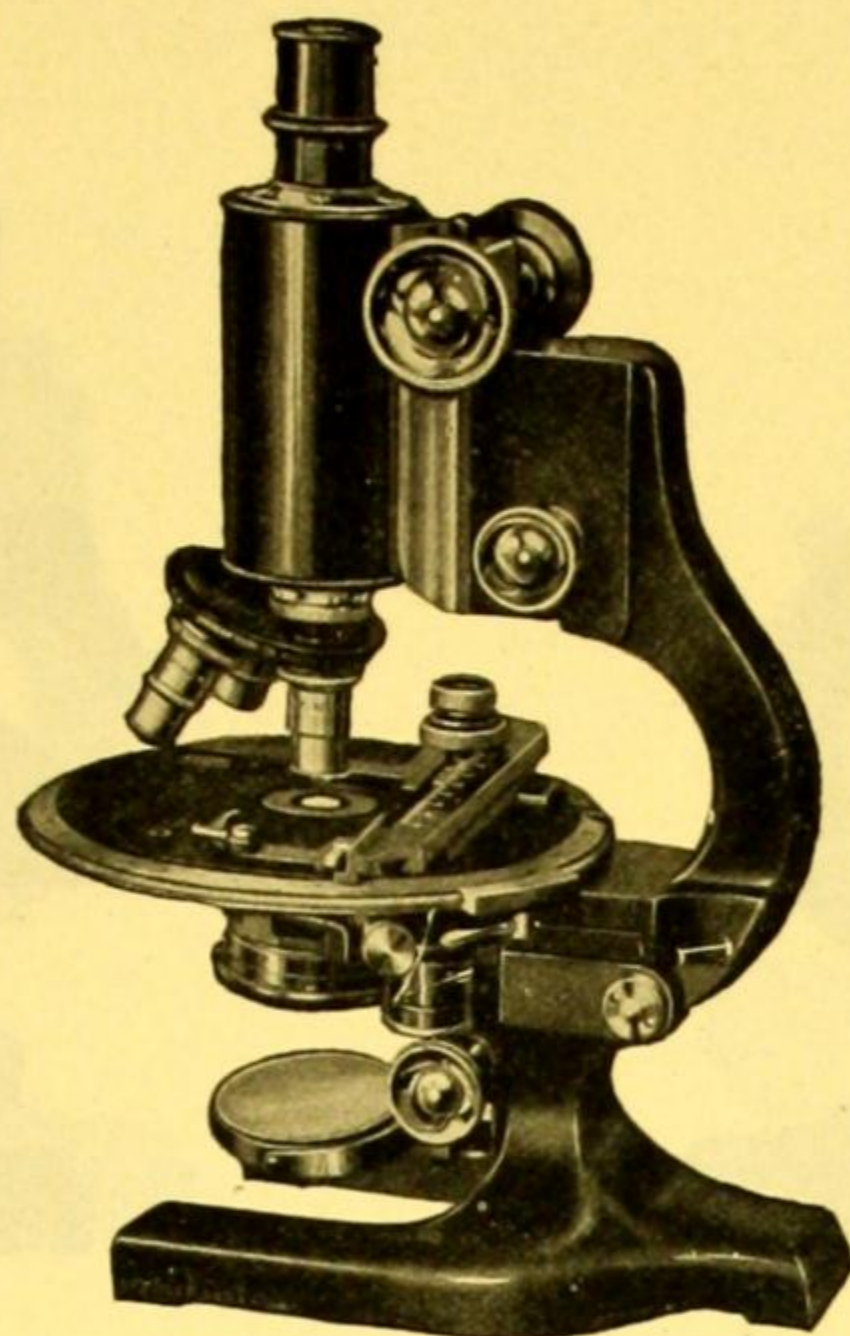


Diagram of Side Fine Adjustment "D."



Nos. 8528-9.

MICROSCOPE, Spencer No. 5, the microscope de-luxe; chosen and used by scientists for the most refined research work. In addition to the general features of the Spencer Microscopes, described on page 318, this microscope possesses the following special features:

The Body Tube, 50 mm in diameter, is of aluminum with a black hard rubber finish and may be so arranged that low power photo-micrographic objectives or standard objectives with Society screw, with or without oculars, may be used. It will take standard oculars.

The Fine Adjustment is the type B described on page 318.

The Revolving Stage is 150 mm in diameter with 130 mm of its surface vulcanite covered. It is centered by means of centering screws and may be clamped in any position. The edge is graduated in degrees and numbered on every 10 degree division. The vernier with which it is provided reads to 3 minutes of arc. A mechanical stage furnished with the microscope is easily attached by removing a plain metal slide from the stage and replacing it with the mechanical stage which fits the same slot. The distance from the optical center to the arm is 100 mm.

The Complete Rack-and-Pinion Substage, carrying the centerable Abbe condenser (N. A. 140) and iris diaphragm with horizontal rack-and-pinion adjustment, permits ready focusing and adjustment of the illumination to meet any requirement. The mirror is mounted on a slotted carrier, which permits adjustments not possible on other types of microscopes.

The Mechanical Stage is operated by buttons mounted on concentric axes one above the other, providing for a movement of 80 mm one way and 50 mm the other way.

The Cabinet is of polished mahogany, provided with a lock and key.

8528. **MICROSCOPE, Spencer No. 5**, complete as described, with **Achromatic Objectives and Huyghenian Oculars**.

No.	5E	5F	5H	5J
Nosepiece	double	double	triple	triple
Objectives, equivalent focus, mm.....	16,4	16,4	16,4,1.8*	16,4,2†
Oculars	10x	6x, 10x	6x, 10x	6x, 10x
Each	\$195.75	198.00	240.00	255.00

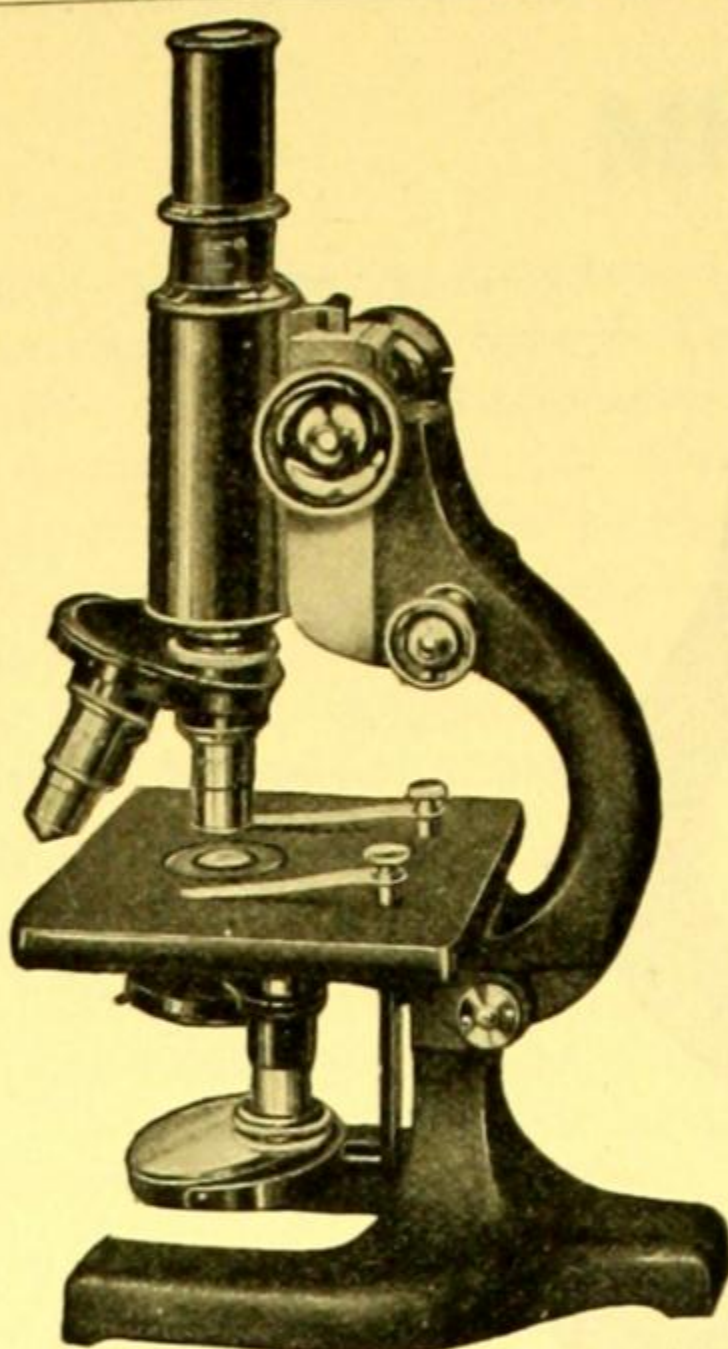
* Oil immersion.

† Fluorite oil immersion.

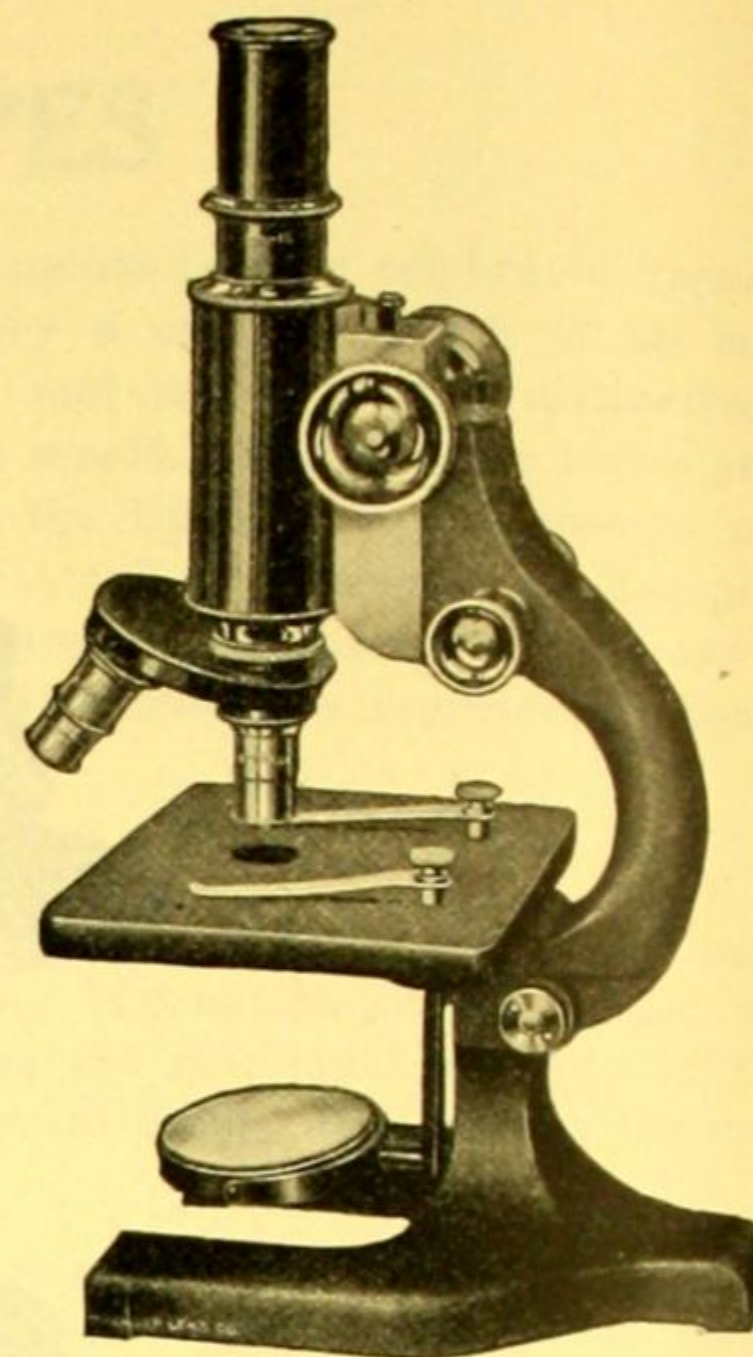
8529. **MICROSCOPE, Spencer No. 5**, same as No. 8528, but with **Apochromatic Objectives and Compensated Oculars**.

No.	5E-Apo.	5F-Apo.	5H-Apo.
Nosepiece	double	double	triple
Objectives, equivalent focus, mm.....	16,4	16,4	16,4,2
Oculars	10x	10x, 15x	10x, 15x
Each	260.25	268.00	350.00

Prices on Nos. 8528 and 8529 subject to 10% discount to hospitals and educational institutions.



No. 8532.



No. 8536.

MICROSCOPE, Spencer No. 44, the most popular of all the Spencer microscopes, many hundreds of which are in daily use in medical, educational and general laboratories. In addition to the general features of the Spencer Microscopes described on page 318, this microscope possesses the following special features:

The Body Tube, 37 mm in diameter, is standard, taking Society screw objectives and standard oculars.

The Fine Adjustment is the type D described on page 318.

The Stage, 112x108 mm, is completely covered with hard rubber, vulcanized directly to the stage plate. It is provided with spring clips for holding slides. The distance from the optical center to the arm is 80 mm.

The Substage is of the standard quick-screw form, permitting the ready removal of the Abbe condenser and iris diaphragm from the optical system.

The Cabinet is of polished mahogany, provided with a lock and key.

8532. **MICROSCOPE, Spencer No. 44**, complete as described, with **Achromatic Objectives** and **Huyghenian Oculars**.

No.	44B	44D	44E	44F	44H	44J
Abbe condenser, N. A. ....	....	....	1.20	1.20	1.20	1.20
Nosepiece	double	double	double	double	triple	triple
Objectives, equivalent focus, mm.	16,4	16,4	16,4	16,4	16,4,1.8*	16,4,2†
Oculars	10x	6x, 10x	10x	6x, 10x	6x, 10x	6x, 10x
Each	\$68.75	71.00	80.75	83.00	125.00	140.00

*Oil immersion.

†Fluorite oil immersion.

Note:—A Down-Swing Condenser Mounting for Nos. 44E, F, H and J can be supplied at \$8.00 additional.

MICROSCOPE, Spencer 64. An excellent instrument, exceedingly desirable for general biology. In addition to the general features of the Spencer Microscopes described on page 318, this microscope possesses the following special features:

The Body Tube, 37 mm in diameter, is standard, taking Society screw objectives and standard oculars.

The Fine Adjustment is the type D described on page 318.

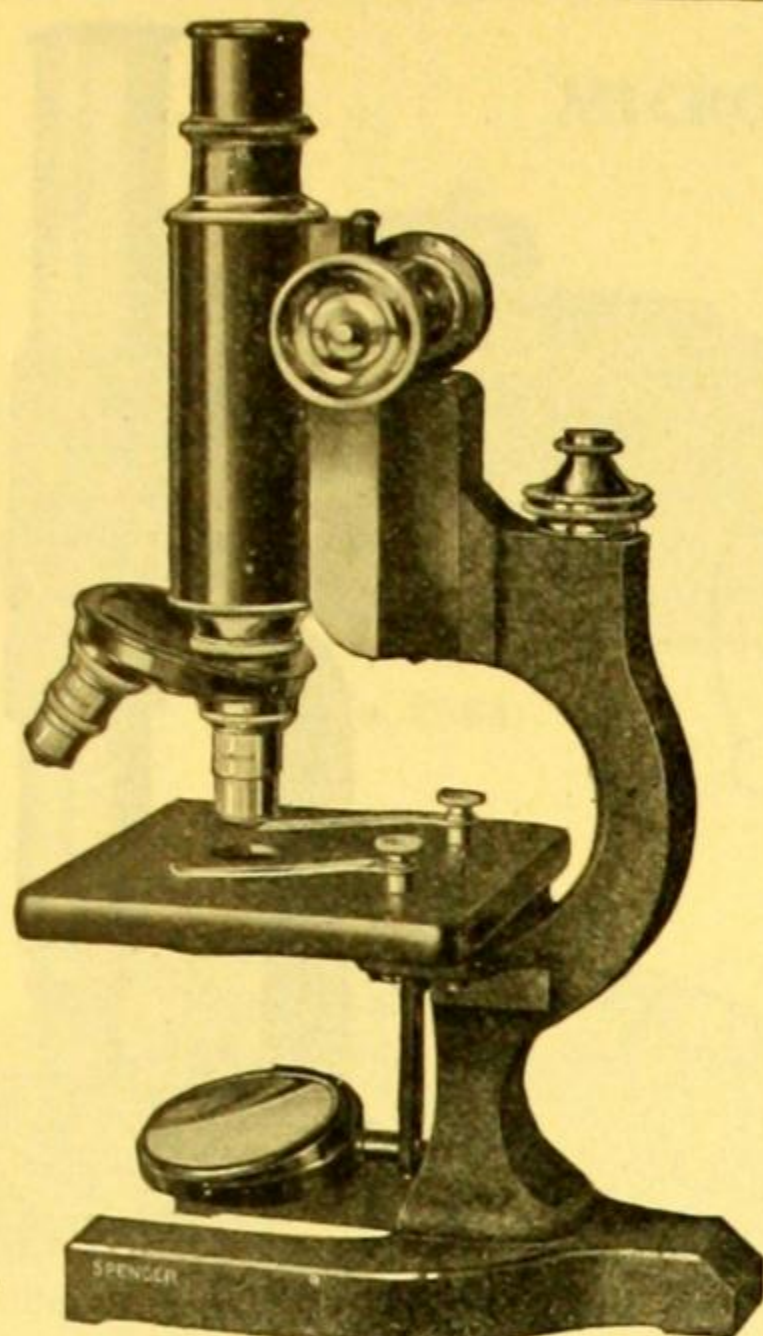
The Stage, 112x108 mm, is completely covered with hard rubber, vulcanized directly to the stage plate. Beneath the stage is an iris diaphragm operated by a knurled adjusting ring, 62 mm in diameter. An Abbe Condenser is supplied when ordered, and is fitted in a simple spiral focusing substage ring. The distance from optical center to arm is 80 mm.

The Cabinet is of polished mahogany, provided with a lock and key.

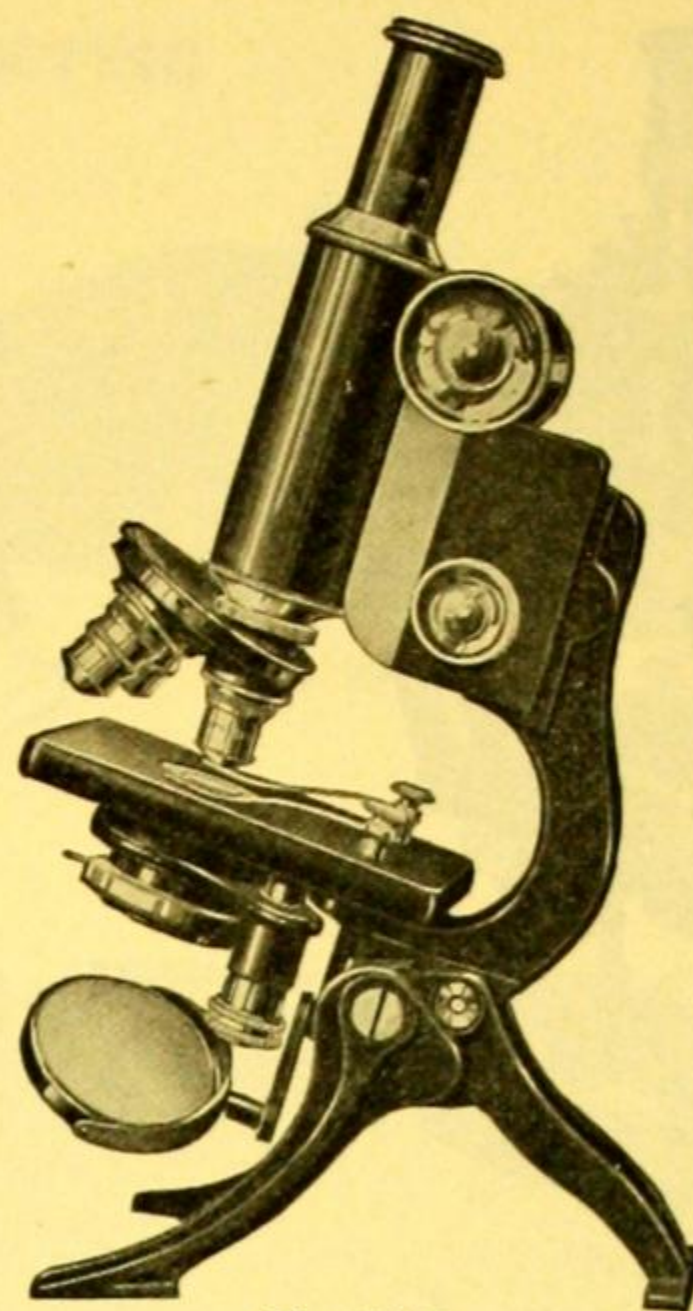
8536. **MICROSCOPE, Spencer No. 64**, complete as described with **Achromatic Objectives** and **Huyghenian Oculars**.

No.	64B	64D	64E	64F	64H
Abbe condenser ....	....	....	N. A. 1.20	N. A. 1.20	N. A. 1.20
Nosepiece ....	....	....	N. A. 1.20	N. A. 1.20	N. A. 1.20
Objectives, equivalent focus, mm.	double	double	double	double	triple
Oculars	16,4	16,4	16,4	16,4	16,4,1.8
Each	10x	6x, 10x	10x	6x, 10x	oil imm.
Each	64.00	66.25	76.00	78.25	120.25

Prices on Nos. 8532 and 8536 subject to 10% discount to hospitals and educational institutions.



No. 8540.



No. 8546.

MICROSCOPE, Spencer No. 65. This instrument is similar to No. 8536, except for the shape of arm and the type of fine adjustment. It is a very high grade microscope at moderate cost.

In addition to the general features of the Spencer Microscopes described on page 318, this microscope possesses the following special features:

The Body Tube, 37 mm in diameter, takes Society screw objectives and standard oculars.

The Fine Adjustment is of the type C described on page 318.

The Stage, 112x108 mm, is completely covered with hard rubber, vulcanized directly to the stage plate. Beneath the stage is an iris diaphragm operated by a knurled adjusting ring. The distance from the optical center to the arm is 80 mm.

A Substage Ring, with spiral slot for focusing the Abbe condenser, is supplied when ordered or may be applied at any time without returning the microscope to the factory. The standard mirror, 50 mm in diameter, is supplied on the usual swinging mirror bar.

The Cabinet is of polished mahogany, provided with a lock and key.

8540. **MICROSCOPE, Spencer No. 65, with Achromatic Objectives and Huyghenian Oculars.**

No.	65B	65D	65E	65F	65H
Abbe condenser .....	....	....	N. A. 1.20	N. A. 1.20	N. A. 1.20
Nosepiece	double	double	double	double	triple
Objectives, equivalent focus, mm.....	16,4	16,4	16,4	16,4	16,4,1.8 oil imm.
Oculars	10x	6x, 10x	10x	6x, 10x	6x, 10x
Each	\$60.50	62.75	72.50	74.75	116.75

MICROSCOPE, Portable, Spencer No. 60. A practical, portable, compound microscope of great service for field or traveling use.

The Stand consists of three legs, which fold back, and which are securely fitted at the inclination joint to make a very stable support for the microscope when set up.

The Arm is of the curved type, graceful in shape, light in weight and very strong. The stand and arm has an alcohol-proof, black crystal finish.

The Body Tube, 37 mm in diameter, takes Society screw objectives and standard oculars.

The Fine Adjustment is of the type B described on page 318.

The Stage, 110x88 mm covered with vulcanite, is rigidly fastened to the arm. It does not fold.

The Substage is of the standard quick-screw form, permitting the ready removal of the Abbe condenser and iris diaphragm from the optical system.

The Carrying Case is aluminum, measuring 8¾x6½x3¾ inches outside, and is so constructed as to be dust proof. In addition to the compartment for the microscope, provision has been made for carrying a haemoglobinometer and haemacytometer. The microscope, objectives and case complete weigh 9½ pounds.

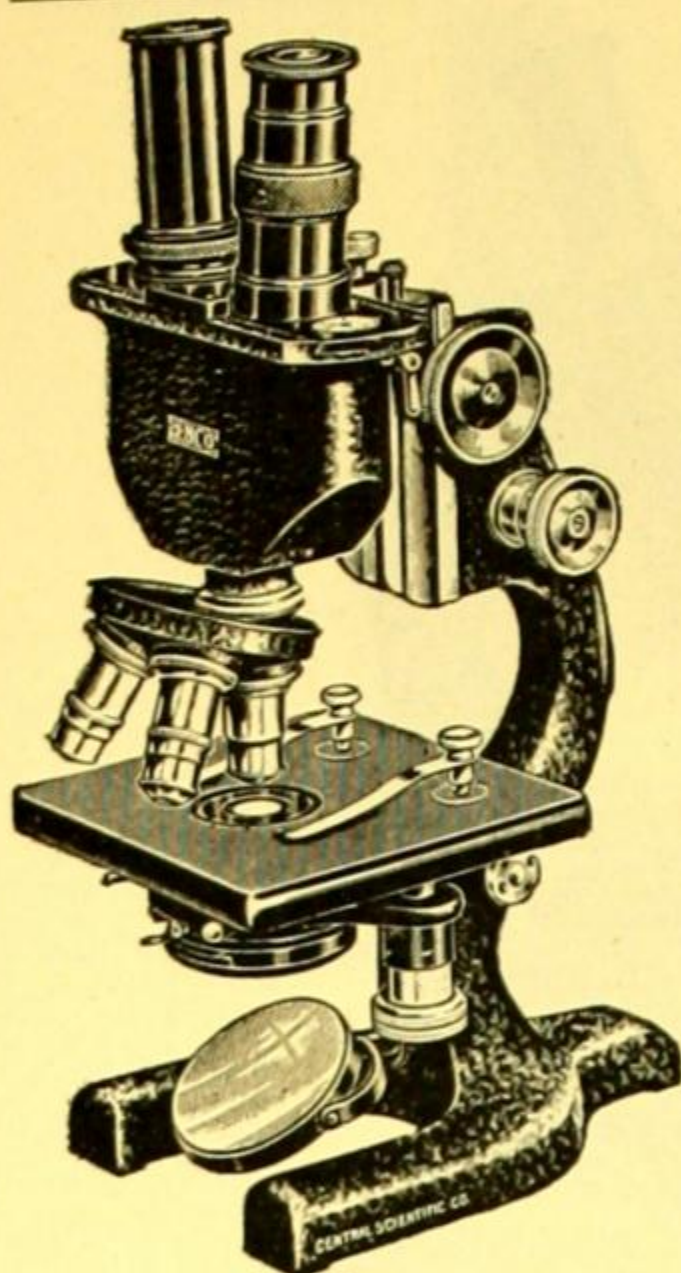
8546. **MICROSCOPE, Portable, Spencer No. 60.** Complete with Achromatic Objectives especially mounted in short mounts provided with threaded protecting caps and with Huyghenian Oculars.

No.	60B	60D	60E	60F	60H	60J
Abbe condenser, N. A.....	....	....	1.20	1.20	1.20	1.20
Nosepiece	double	double	double	double	triple	triple
Objectives, equivalent focus, mm.....	16,4	16,4	16,4	16,4	16,4,1.8*	16,4,2†
Oculars	10x	6x, 10x	10x	6x, 10x	6x, 10x	6x, 10x
Each	103.75	106.00	115.75	118.00	160.00	175.00

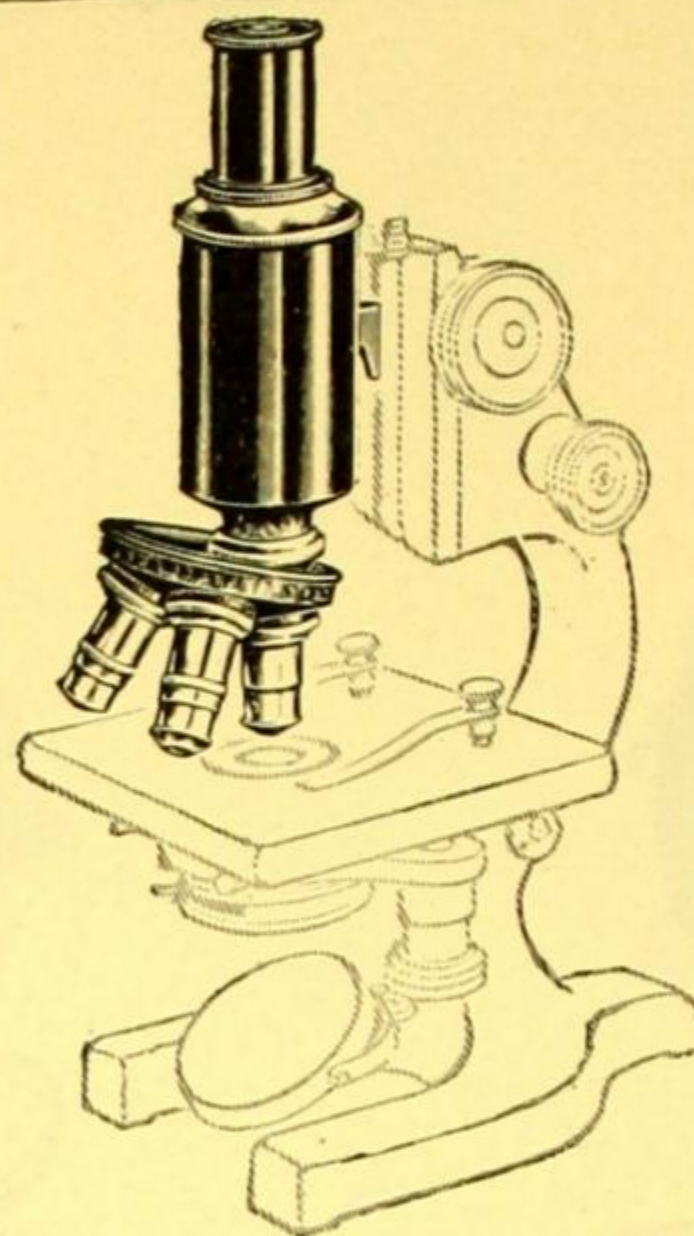
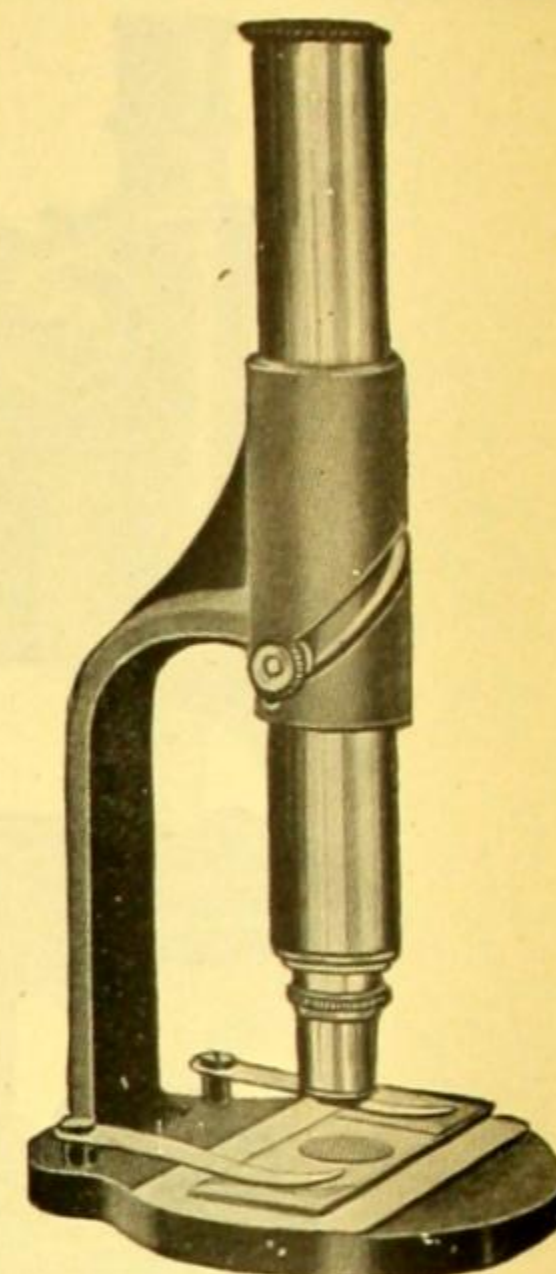
*Oil immersion.

†Fluorite oil immersion.

Prices on Nos. 8540 and 8546 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8548.

No. 8549
(shown in place).

No. 8560.

MICROSCOPE, Binocular, Spencer No. 3. A very desirable microscope for use in routine or research work requiring constant use of the microscope. Both eyes are used simultaneously at their normal convergence for examining objects or reading print at the normal distance of 18 inches. Such convergence is not conducive to eye strain. A more correct impression of the specimen under examination is conveyed through the stereoscopic effect, which makes the object appear more realistic and vivid. A feature of this model is the interchangeable monocular body by means of which the instrument can be instantly changed into a monocular microscope, using the same objectives and oculars furnished with the binocular body.

In addition to the general features of the Spencer Microscope described on page 318, this microscope possesses the following special features:

The Binocular Body consists of a special prism system, in a dust proof case, which divides the beam of light and directs it to each eye through a pair of converging ocular tubes, which are adjustable for both pupillary distance and independent focusing. A graduated millimeter scale is conveniently placed so that after the pupillary distance has once been determined, the oculars can be instantly set at the proper distance without actual trial. Shutters are provided to assist in obtaining proper focusing for each eye. The Binocular Body may be instantly replaced by a Monocular Body Tube of 50 mm diameter for making photomicrographs or single tube examinations. Society screw objectives and oculars are used on both sides.

The Fine Adjustment is of the type B described on page 318.

The Stage, 112x108 mm, is completely covered with hard rubber, vulcanized directly to the stage plate. It is provided with spring clips for holding slides. The distance from the optical center to the arm is 80 mm.

The Substage is of the standard quick-screw form, permitting the ready removal of the Abbe condenser and iris diaphragm from the optical system.

The Cabinet is of polished mahogany, provided with a lock and key.

8548. **MICROSCOPE, Binocular, Spencer No. 3**, complete as described with **Achromatic Objectives** and **Paired Huyghenian Oculars**.

No.	3E	3F	3H	3J
Abbe condenser, N. A.	1.20	1.20	1.20	1.20
Nosepiece	double	double	triple	triple
Objectives, equivalent focus, mm.	16,4	16,4	16,4,1.8*	16,4,2†
Oculars	10x	6x, 10x	6x, 10x	6x, 10x
Each	\$163.50	168.00	210.00	225.00

*Oil immersion.

†Fluorite oil immersion.

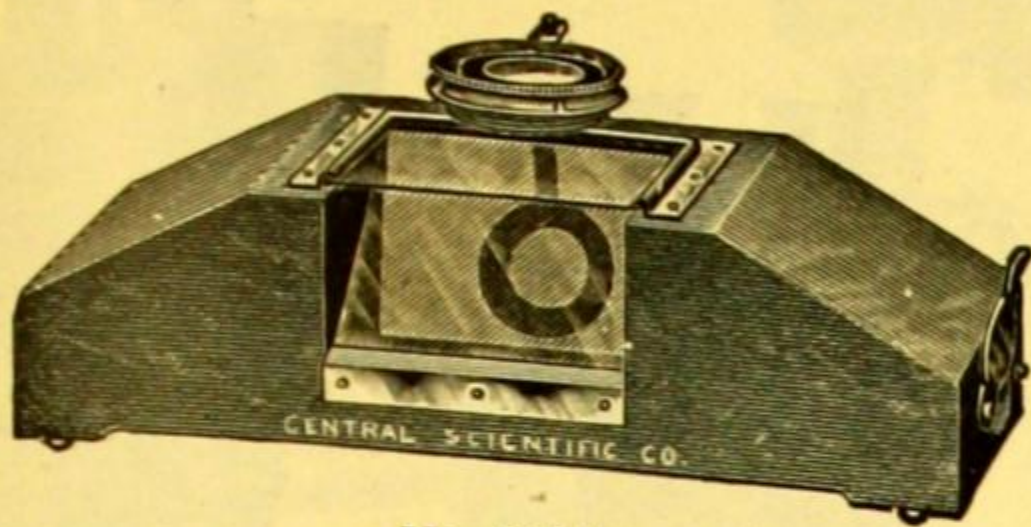
8549. **Monocular Body Tube**, 50 mm diameter. For replacing Binocular Body of No. 8546 microscope for photomicrographic work or single tube examinations. Without oculars, objectives or nose-piece 20.00

MICROSCOPE, Brinell, see **Hardness Testers**.

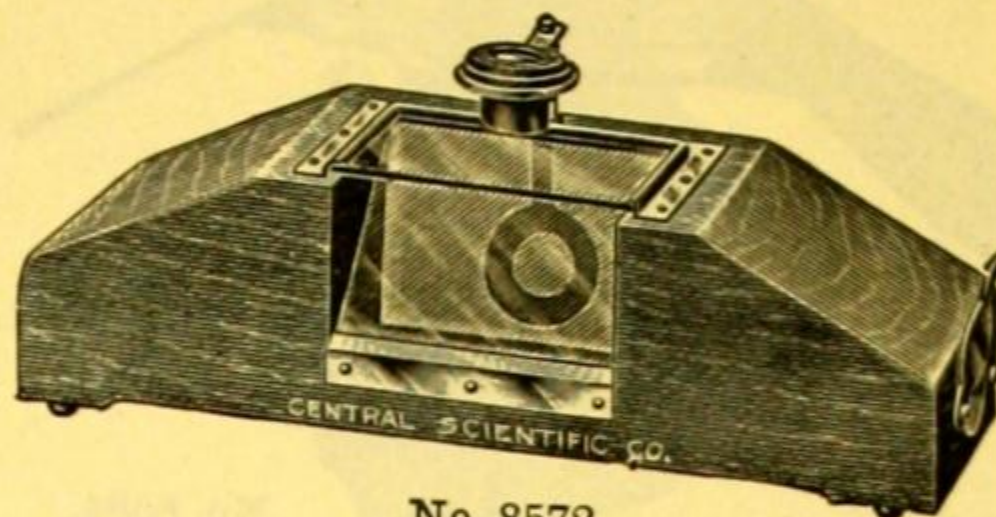
8560. **MICROSCOPE, Demonstration**. With the exception of the tube, this stand is made entirely of aluminum, thus making it very light. This, with the convenient handle, makes it superior to all others for handing from person to person during class demonstrations. The objective is accurately and easily focused by a spiral movement which is so arranged that the objective may be securely fastened in any focus. The objective is always in sight, thereby being easier to focus, and to exchange for another. The slide is placed upon the stage as in any other microscope and there is no danger of disturbing the cover glass. Furnished with 8x eyepiece and 16 mm objective..... 18.50

Prices on Nos. 8548, 8549 and 8560 subject to 10 per cent. discount to hospitals and educational institutions.

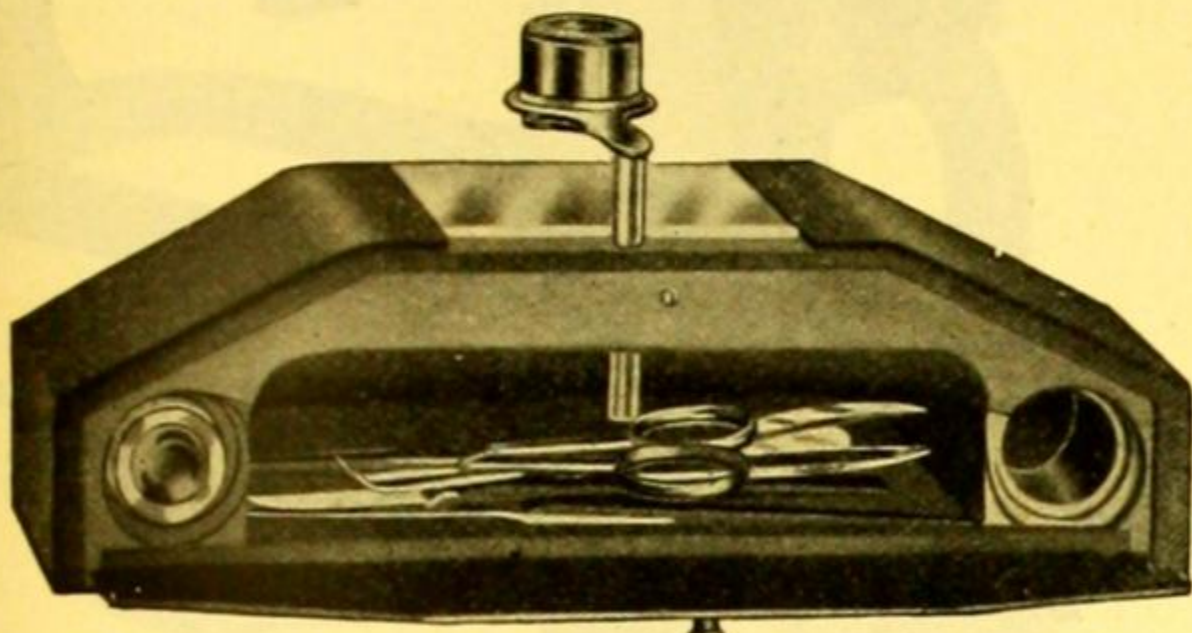
MICROSCOPES, DISSECTING



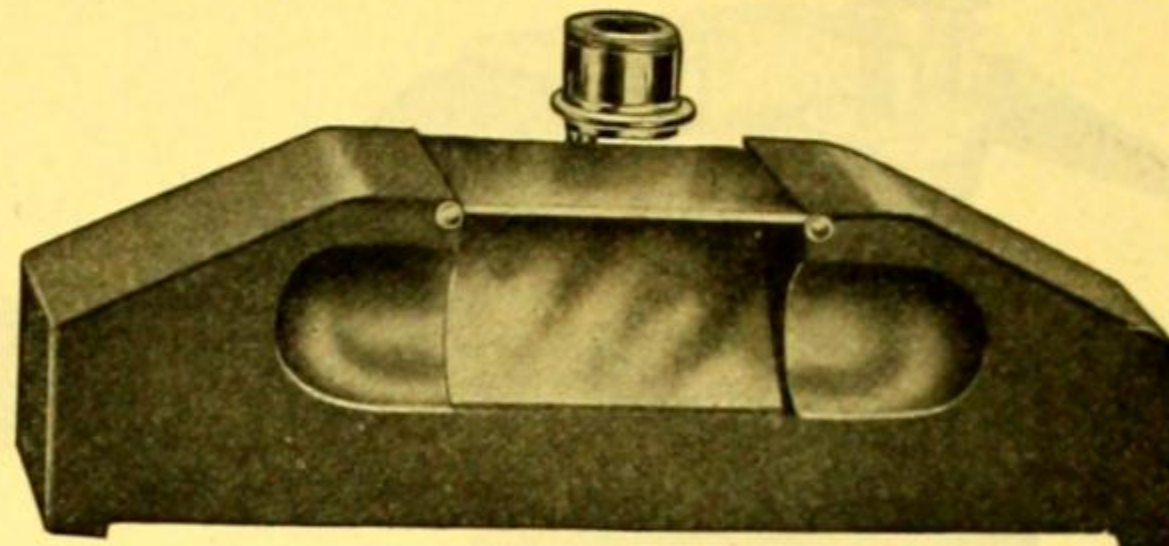
No. 8564.



No. 8572.



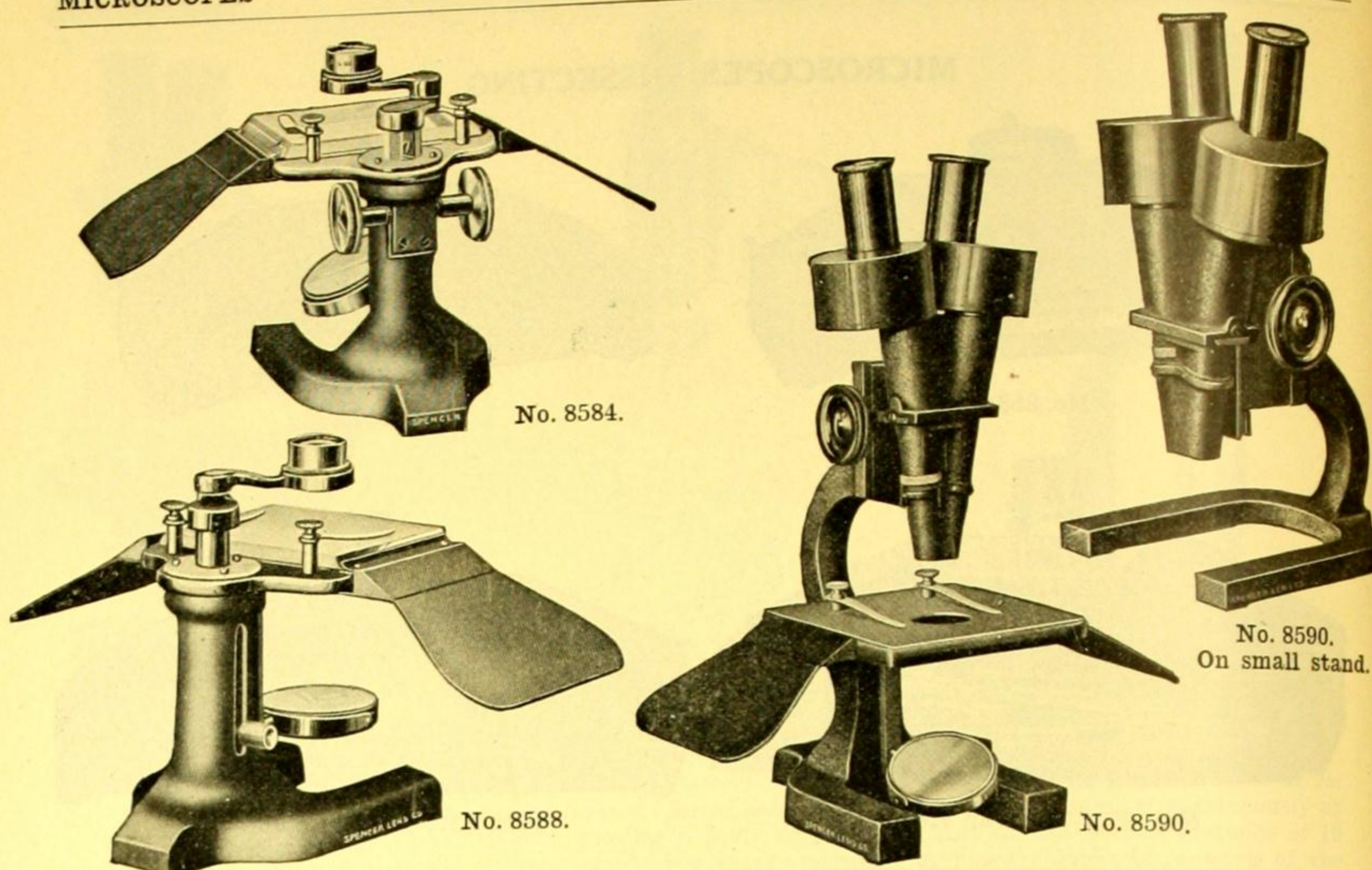
Nos. 8577-78 (rear view.)



Nos. 8577-78 (front view).

8564. **MICROSCOPE, Dissecting, Barnes.** A very convenient form of a simple microscope for student work. Consists of a block of hardwood, shaped to provide hand rests on each side. It has a polished mahogany finish. A cylindrical chamber, 22x180 mm, closed by a metal slide, is provided in the base to hold the student's dissecting needles and scalpels. The stage is of glass, 60x85 mm, and is removable. A mirror is permanently fixed in the block at angle to provide maximum illumination. A two lens magnifier of large aperture is mounted in a threaded ring in the holder, which construction permits fine focusing by turning the lens mounting. The lens holder is designed to swing across the entire stage about a center post arranged to slide vertically, providing the coarse adjustment. The individual lenses supplied with this microscope vary slightly in working distance and magnification; the average lens has a working distance of 35 mm and magnifies $3\frac{1}{2}$ times. \$2.75
8567. **Magnifier and Holder** consisting of No. 8565 magnifier with lens holder, for replacements in No. 8564 1.00
8568. **Block, only**, of No. 8564 with mirror and stage, but without magnifier and lens holder . . . 1.75
8569. **Glass Mirrors, only**, of No. 8564, 75x75 mm. each .08
per dozen .75
8570. **Glass Stages, only**, of No. 8564, 60x85 mm. each .08
per dozen .75
8572. **MICROSCOPE, Dissecting**, similar to No. 8564, but provided with a 12x doublet magnifier which gives better definition and greater magnification than the magnifier of No. 8564. Working distance 12 mm, magnification 12 times. 3.75
- Note:**—If a 6x or 9x doublet magnifier with 22 mm and 15 mm working distance is desired instead of the 12x, it can be supplied at the same price.
8573. **Lens Holder, only** of No. 8572 for holding doublet magnifiers30
8577. **MICROSCOPE, Improved Dissecting.** Of the same general design as No. 8564, but with the addition of several improvements. The parts of the block at either side of the mirror are cut out to allow light from the sides to strike the mirror, thus doing away with the necessity of the operator facing the source of light in order that the light may strike the mirror. The block is hollow beneath and back of the mirror, forming a convenient receptacle for dissecting tools and lenses. This is closed by a door, which is hinged at the lower edge of the block. This is most convenient because it is not necessary to remove the specimen from the stage or the lens from the holder when a new dissecting tool or lens is wanted. The lens is held in an arm, which permits movement from side to side and provides for focusing. A black and white metal background is furnished with each instrument. The glass stage is 65x85 mm, with 9x doublet magnifier having a working distance of 15 mm. 5.50
8578. **MICROSCOPE, Improved Dissecting**, same as No. 8577, but with 12x doublet magnifier having a working distance of 22 mm. 5.50

Prices on Nos. 8577 and 8578 subject to 10 per cent. discount to hospitals and educational institutions.



8584. **MICROSCOPES, Spencer Dissecting.** An extremely well made, thoroughly serviceable and convenient instrument at a very moderate cost. It is made with special reference to stability, ease of manipulation and durability. The focusing is accomplished by diagonal rack-and-pinion, moving a solid brass rod, whose bearings provide great steadiness and a very smooth movement of long range, so that lenses of long focus may be used. Two milled pinion heads allow either hand to be used in focusing. An extra large stage is provided, covered with a heavy polished glass plate, 75 mm x 100 mm, easily removed. The jointed lens arm permits the lens to be used over any part of the stage. Plane and concave mirror is furnished. The hand rests are of metal, detachable. In hardwood cabinet.

No.	A	B	C	D
Number of lenses.....	1	2	1	2
Type of lens.....	doublet	doublet	triple aplanat	triple aplanat
Magnifying power, diameters.....	9	6, 12	9	6, 12
Equivalent focus, mm.....	27.8	41.6, 20.8	27.8	41.6, 20.8
Working distance, mm.....	15	22, 12	24.5	36.8, 18.4
Each	\$16.25	18.00	19.25	24.00

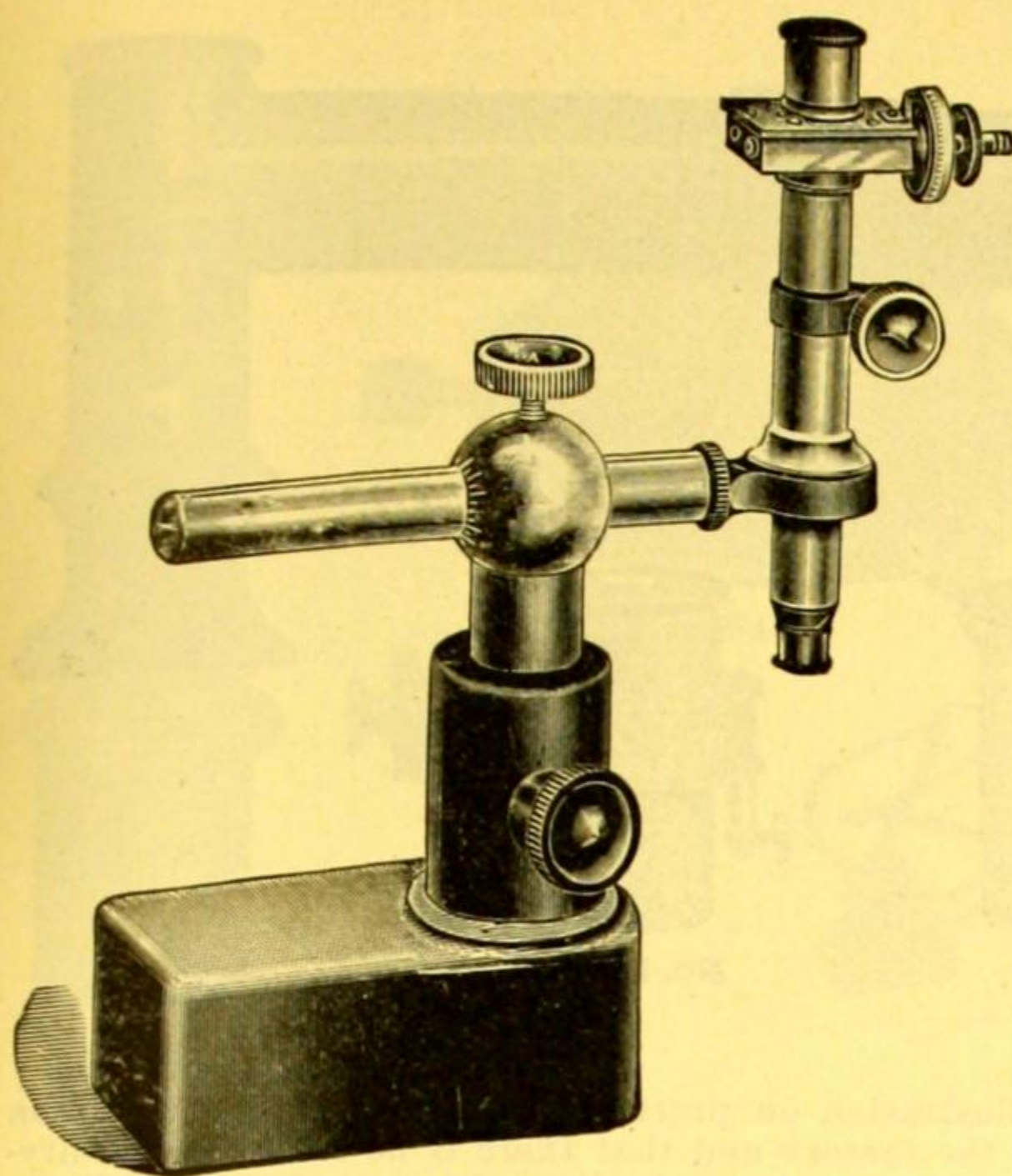
8588. **MICROSCOPES, Spencer Dissecting,** similar in construction to No. 8584, with the exception that instead of the rack-and-pinion focusing adjustment it is equipped with a friction sliding tube adjustment. A button at the side of the pillar moves a strong cylindrical lens arm support, whose bearings extend the whole length of the inner surface of the hollow pillar, giving a steady, smooth movement. **Without hand rests,** in hardwood cabinet.

No.	A	B	C	D
Number of lenses.....	1	2	1	2
Type of lens.....	doublet	doublet	triple aplanat	triple aplanat
Magnifying power, diameters.....	9	6, 12	9	6, 12
Equivalent focus, mm.....	27.8	41.6, 20.8	27.8	41.6, 20.8
Working distance, mm.....	15	22, 12	24.5	36.8, 18.4
Each	14.50	16.50	17.50	22.25

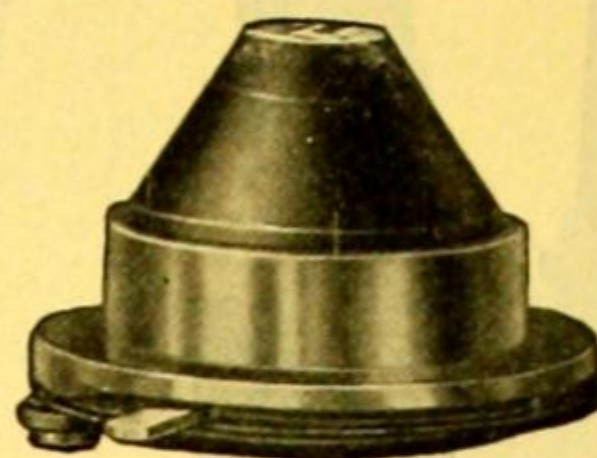
8590. **MICROSCOPE, Spencer Binocular Dissecting.** An extremely convenient binocular microscope for work requiring from 8 to 74 diameters magnification and a working distance of 25 mm or over. Industrial laboratories will find this instrument (when mounted on the small stand), very useful for examining large pieces of material such as wood, textiles, paper, leather and various manufactured metal products. Both the large and small stands are furnished with the equipment.

No.	A	B	C
Paired objectives, equivalent focus, mm.....	40	48, 32	55, 40, 25
Paired oculars	10x	6x, 10x	4x, 6x, 10x
Magnifications possible, diameters.....	34	15, 25, 29, 46	8, 12, 13, 19, 22 30, 34, 45, 74.
Each	90.00	110.00	132.00

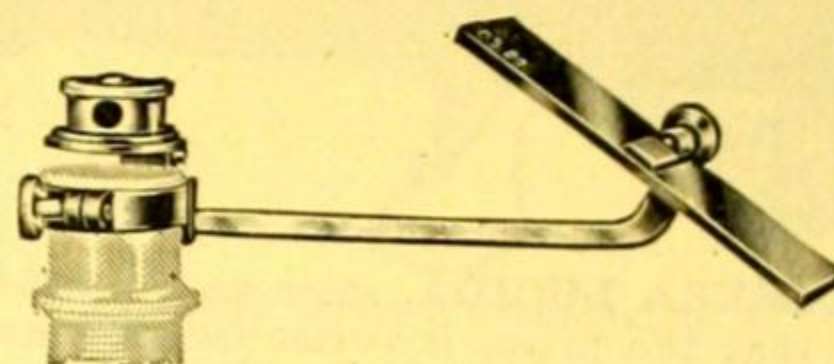
Prices on Nos. 8584, 8588 and 8590 subject to 10 per cent. discount to hospitals and educational institutions.



No. F586.



No. 8610.



Nos. 8614-16.

F586. MICROSCOPE, Measuring, with eyepiece micrometer. This micrometer is of new design and is guaranteed to be of the highest order of workmanship and accuracy. The pitch of the micrometer screw is 0.25 mm, and its range is 10 mm; since the micrometer head is divided into 100 parts it is possible to read to 0.0025 mm at the cross hairs. Since the magnification of the objective is about 3 diameters this is equivalent to a reading of about 0.0008 mm on the object being measured. Total magnification, about 30 diameters. Complete with No. F591 Support. \$65.00

F587. MICROSCOPE, Measuring. Same as No. F586, without support..... 47.00

F591. MICROSCOPE SUPPORT. A heavy, adjustable support for measuring microscopes. The microscope can be held rigidly in any position, as all joints can be tightly clamped. The base is sufficiently heavy to insure the stability required in a microscope used for accurate measurements. The top of the base is machined, so as to enable the attaching of stages or other accessories. The diameter of the horizontal and vertical arms is the same and the microscope may be clamped in a horizontal position, so as to read a vertical scale. Vertical range about 9 cm; horizontal range about 12 cm. Illustration shows Microscope No. F587 used in connection with the support. Support only, without microscope 18.00

MICROSCOPES, Metallurgical, see **Metallographic Apparatus.**

MICROSCOPES, Projection, see **Catalog F of Physical Apparatus.**

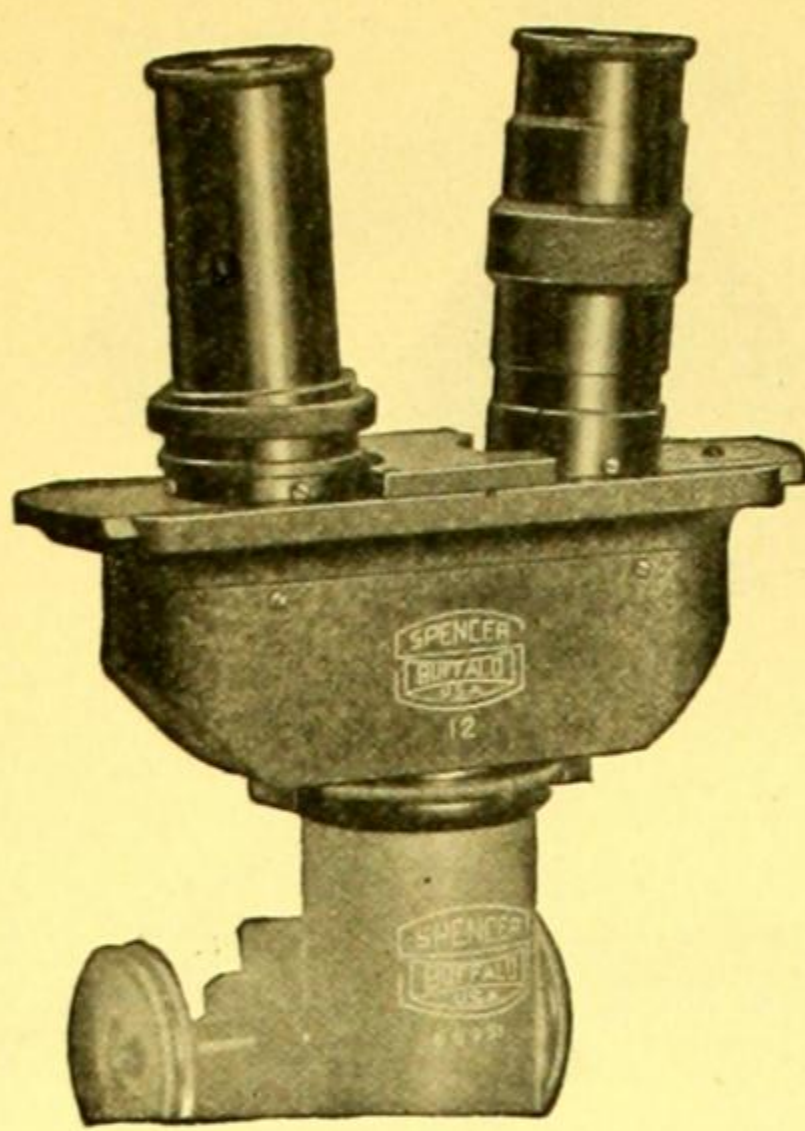
MICROSCOPE ACCESSORIES

(Alphabetically Arranged.)

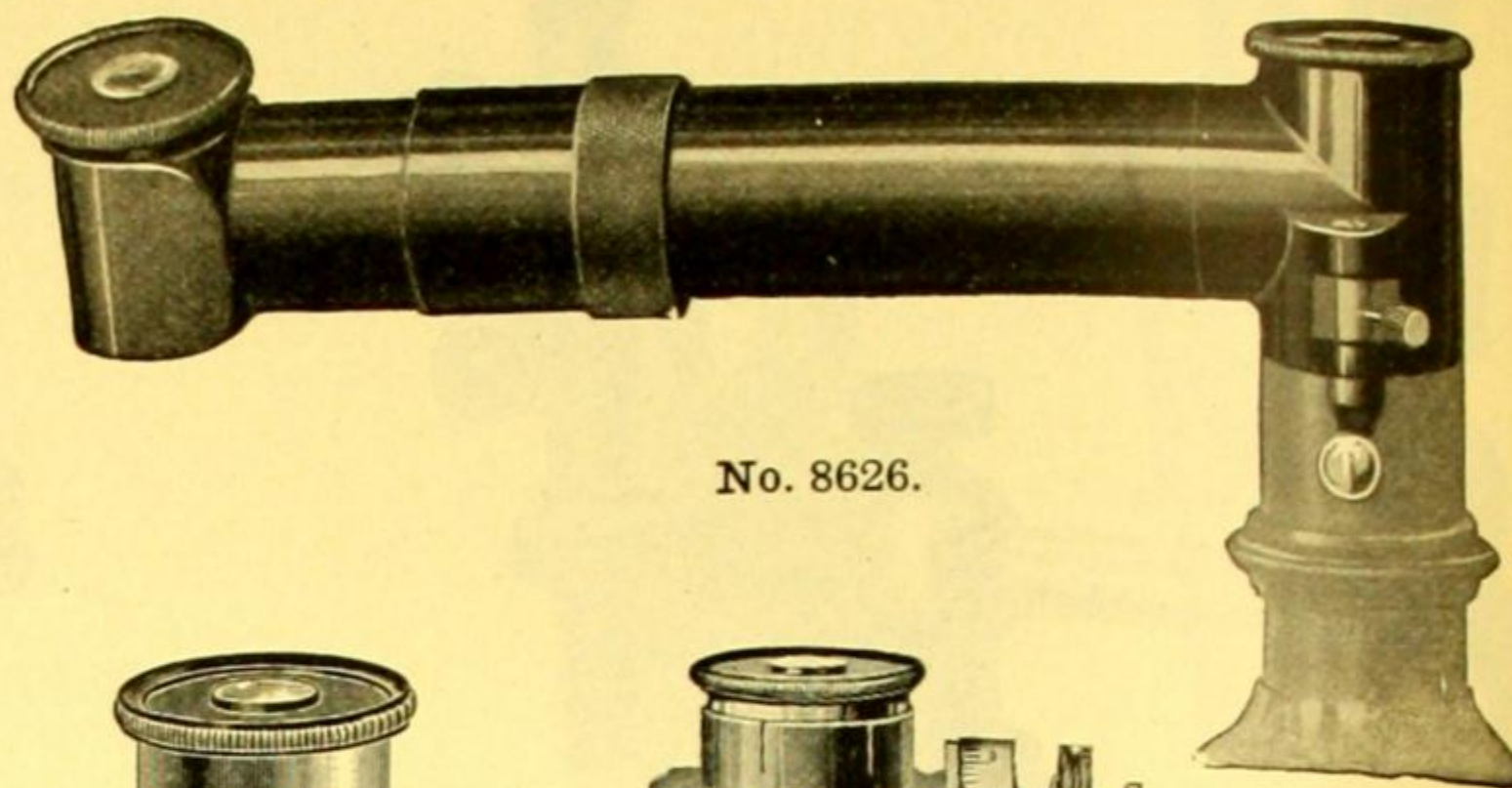
8610. ABBE SUBSTAGE CONDENSER. In order to secure the best results with objectives of high power, an Abbe Condenser must be used. The condenser illustrated has an aperture N. A. 1.20 and meets all the requirements of practical work. It is fitted with an iris diaphragm beneath to modify the amount of light, and is also provided with a ring beneath the iris to hold a blue glass for cutting out the yellow rays of artificial light; or to hold a center stop which to some extent will provide dark field illumination. The mounting is like the cut for the friction collar substages or is swung on the arm of the down-swing condenser mounting.. 12.00

8614. CAMERA LUCIDA, Abbe's, designed to satisfy the demands of the serious laboratory worker. It has a very large mirror, 70 mm x 105 mm, which is supported on adjustable, graduated mirror bar. Its unique, compact mounting makes it possible to place the eye sufficiently close to the prism so that the pupil takes in all of the divergent rays coming from the whole of the field of the ocular, making the field appear as large and the object very nearly as distinct as when viewed without the camera. The prism is so mounted that the opening in the silvering can be lowered in the case of the higher power oculars, or raised with the lower powers until it comes to the exact focus of the ocular. The prism can be so centered by two concentric screws that the field is free from color to the extreme edge. The light from it is modified by a series of smoked screens of different densities which may be revolved in and out of line between the mirror and the prism. It is made for the standard size microscope tubes, now in use by practically all American and European makers. Complete in hardwood case..... 25.00

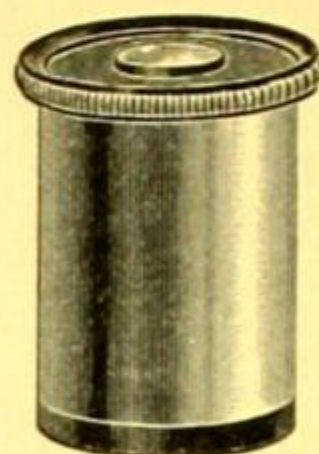
Prices on Nos. 8610 and 8614 subject to 10 per cent. discount to hospitals and educational institutions.



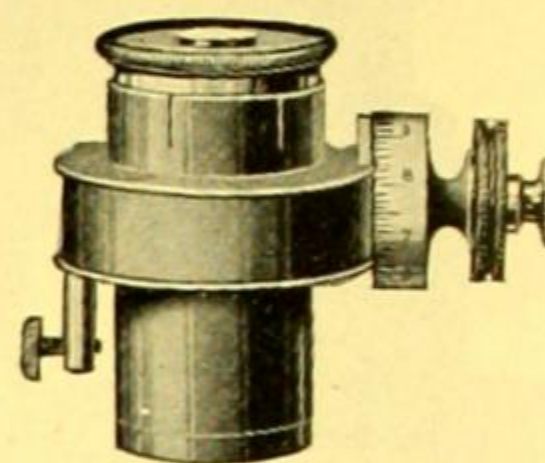
No. 8624.



No. 8626.



No. 8630.



No. 8634.

8616. **CAMERA LUCIDA**, same as No. 8614 (see illustration on preceding page), with the exception that the prism is permanently centered at the factory and that there is no means for modifying the light from the ocular. The prism is the same size and mounted in a similar way. There are no loose parts to get out of place when the prism is moved in and out of the optical center. Complete in hardwood case..... \$15.00

8624. **EYEPIECE, Binocular**, for attachment to monocular microscopes in place of the usual eyepiece to enable the operator to enjoy the advantages of a mon-objective binocular microscope without the outlay occasioned by purchasing another special microscope. This device consists of a prism system of the same construction as that of the No. 8548 Binocular Microscope, fitted with two converging eyepieces having adjustments for pupillary distance and independent focusing. It carries a correction lens to compensate for the increased tube length. In attaching this device to the monocular microscope, the knurled ring at the top of the microscope body tube, through which the regular draw tube slides, is removed and the binocular body is fastened in place by means of another similar knurled ring attached to the binocular eyepiece. In ordering kindly state the make of microscope to which this device is to be attached, as the regular ring supplied fits only a Spencer stand. For other makes of microscopes a small additional charge will be made for the special threaded ring. Complete with two paired 10x Huyghenian oculars, in a polished hardwood case 50.00

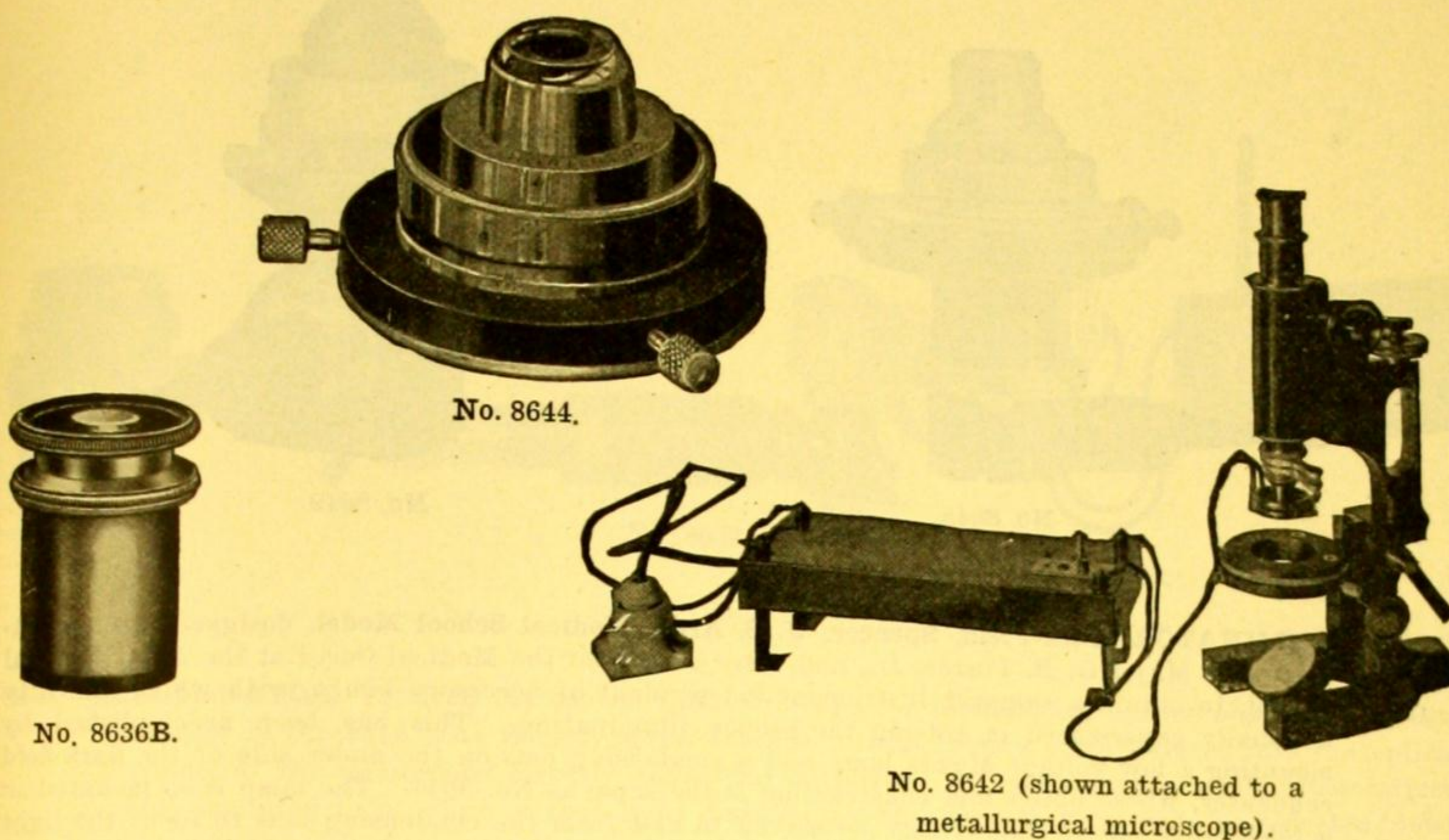
8626. **EYEPIECE, Demonstration**, for attachment to a compound microscope in place of the regular ocular to enable two persons to view the same object at the same time. A needle pointer operated by a knurled handle just below the ocular of the microscope enables the instructor to call attention to any desired detail in the specimen. A knurled ring on the horizontal tube serves to focus the outside ocular independently of the body tube of the microscope, an attachment not found on similar devices of this nature. Complete with two 6x oculars, in polished hardwood case 30.00

8630. **EYEPIECES, Huyghenian**. In arranging the focal distance of the Spencer eyepieces, the method has now been adopted of marking them with figures that indicate in each case how many times the eyepiece enlarges the objective image, projected the distance of distinct vision (250 mm or 10 inches). For example, the 4x eyepiece magnifies the objective image four times, and the magnification of the 8x eyepiece will be twice as great under similar conditions. A 10x ocular now takes the place of the old 8x and a 5x takes the place of the 4x, the old designation being based on the magnifications of the image projected the distance of the optical tube length, 160 mm. The eyepieces are made to fit the standard tube of the Royal Microscopical Society.

No.	A	B	C	D	E	F
Magnifying power, diameters.....	4	5	6	8	10	12
Equivalent focus, mm.....	62.5	50	40	30	25	20
Equivalent focus, inches.....	2½	2	1¾	1½	1	¾
Each	2.25	2.25	2.25	2.25	2.25	2.25

8634. **EYEPIECE, Micrometer**, with movable scale 5 mm in length, divided into ¼ mm divisions. The graduated drum, divided into 100 divisions, moves the scale ¼ mm for each revolution, thus permitting readings to be made to ¼₁₀₀ mm. This instrument has a decided advantage over the filar micrometer in that it is not necessary to move the cross hairs the entire length of the object. Complete with case..... 34.00

Prices on Nos. 8616, 8624, 8626, 8630 and 8634 subject to 10 per cent. discount to hospitals and educational institutions.



8636B. EYEPIECE, Micrometer, with fixed scale, for use in place of the ordinary microscope ocular, when measurements are to be made in the specimen. It consists of a special Huyghenian ocular with a finely ruled glass disc mounted between the lenses. The eye lens is adjustable for exact focusing of the scale. The scale is 5 mm in length divided into 100 parts, every fifth and tenth lines being longer than the others. The eyepiece has the same magnifying power as a 10x Huyghenian ocular. \$6.00

For **MICROMETER DISKS** and **STAGE MICROMETERS**, see Nos. 8730 to 8734.

8642. ILLUMINATOR, Silverman (patented), for use with all types of microscopes to provide a light source of exceptional brightness for the examination and photography of specimens either transparent or opaque. The essential part of the Silverman apparatus is the circular mazda lamp, which surrounds the microscope objective where it is needed, that is, directly on the field to be examined. It was primarily designed for the microphotography of metallurgical specimens, but in the medical laboratory unsectioned pieces of bone or tissue may be examined with the greatest ease. A stage adapter carrying an illuminator holder is provided so that the lamp may be clamped stationary either above or below the microscope stage. The voltage of the ordinary electric light circuit must be reduced to a low voltage for this lamp by means of the resistance supplied with the complete equipment. Complete with one illuminator holder, two illuminator lamps of colorless glass, one resistance with switch and key, one flexible lamp cord to connect illuminator to resistance, one attachment plug and cord to connect resistance to lighting circuit, one stage adapter, one shutter, one absorption disk and resistance.

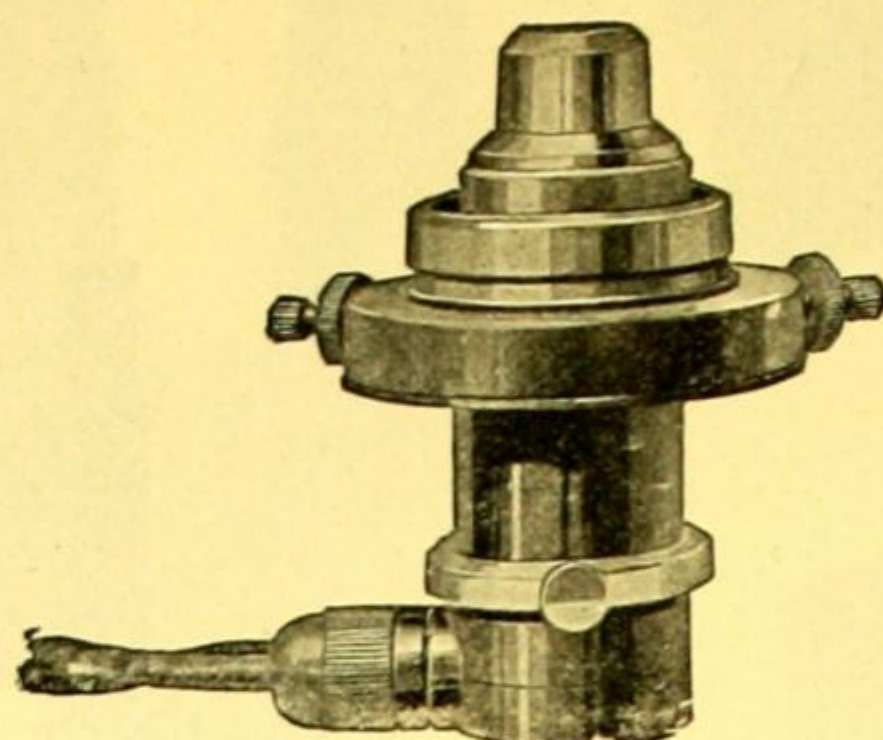
No.	A	B
For volts	110	220
Each	45.00	46.00

8643A. Lamp, Circular, for No. 8642 of plain (colorless) glass 4.00

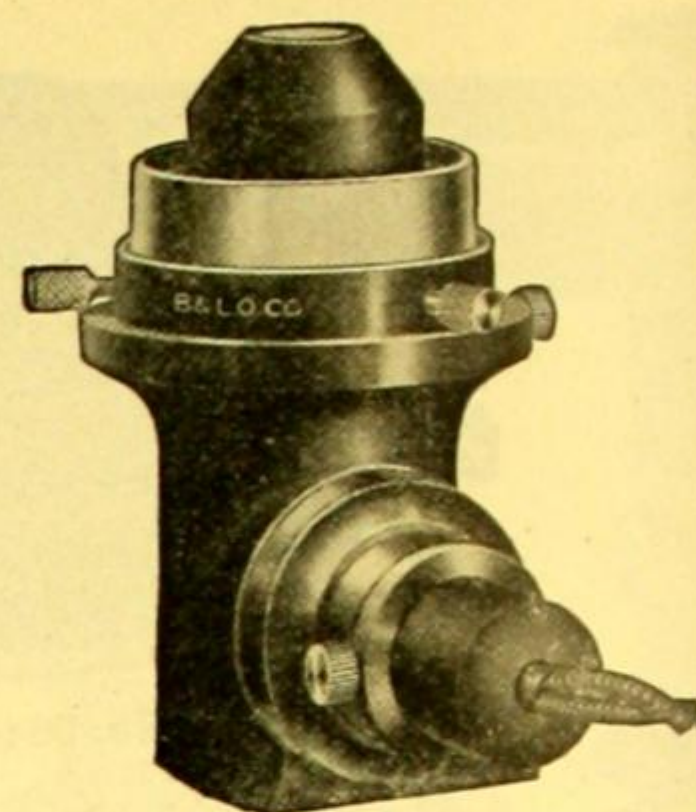
8643B. Lamp, Circular, for No. 8642 of Daylight (blue) glass 4.50

8644. ILLUMINATOR, Dark-Field, Spencer, for use on the microscope in place of the Abbe Condenser for making dark ground examinations. This device finds application in the microscopic examinations of living material in which minute details must be differentiated without staining and is a necessity in the detection of the presence of the spirochete *Treponema pallidum* in fresh tissue juices. It is provided with centering screws by which its position can be accurately controlled. A diaphragm is included which must be inserted in the oil-immersion objective in order to reduce the numerical aperture to less than 1.00. A very strong source of light is required for use with the Dark Field Illuminator. Hand Feed Arc Lamp No. 8682, or the High Power Mazda Lamp No. 8715, are especially suitable for this purpose. Complete with diaphragm for 1.8 mm oil-immersion objective, in case. 22.00

Prices on Nos. 8636B and 8644 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8645.



No. 8649.

8645. **ILLUMINATOR, Dark-Field, Spencer, U. S. Army Medical School Model**, designed in co-operation with Major G. B. Foster, Jr., and other officers of the Medical Corps at the Army Medical School, to obtain a compact instrument independent of accessory lamps, with which difficulty is usually experienced in getting the proper illumination. This has been accomplished by mounting a low voltage Mazda lamp and a condensing lens on the under side of the dark-field condenser, whose optics and construction is the same as No. 8644. The lamp is so mounted in a telescoping sleeve that it may be moved to and from the condensing lens to focus the light properly for illuminating the system. By means of small centering screws it may be centered to the optical axis. Larger independent centering screws are provided for centering the lens system. **A resistance is required when used on lighting circuits.** Complete with diaphragm for 1.8 mm oil-immersion objective, lamp cord with socket, in plush lined wooden case, but **without resistance**..... \$35.00

8646. Resistance for use with No. 8645 to reduce lighting voltage, A. C. or D. C. to 6 volts.		
No.	A	B
For volts	110	220
Each	6.00	8.00

8647. Lamp, Incandescent, Mazda, 6 volts, for No. 864565

8649. **ILLUMINATOR, Dark-Field, B. & L.**, with attached electric lamp. Consists of the usual dark-field condenser with a compactly constructed illuminating device possessing many desirable features. The dark-field condenser may be replaced by the usual Abbe Condenser for transparent work. The lamp housing is of aluminum finished in black and contains a 6 volt, 12 candle power, double contact, bayonet socket lamp, such as is used in automobile headlights, mounted in the focus of a strong curve condensing lens, which directs all the light into the dark-field condenser. If desired the light source may be used with any microscope without either the dark-field or Abbe condenser as a substage microscope lamp. **A resistance is required when used on lighting circuits.** Complete with diaphragm for oil-immersion objectives, in polished hardwood case..... 35.00

- 8649A. Lamp, Incandescent, Mazda, 6 volts, 12 candle power, bayonet socket, double contact with V filament for No. 8649..... .55

For Resistance for No. 8649, see No. 8646.

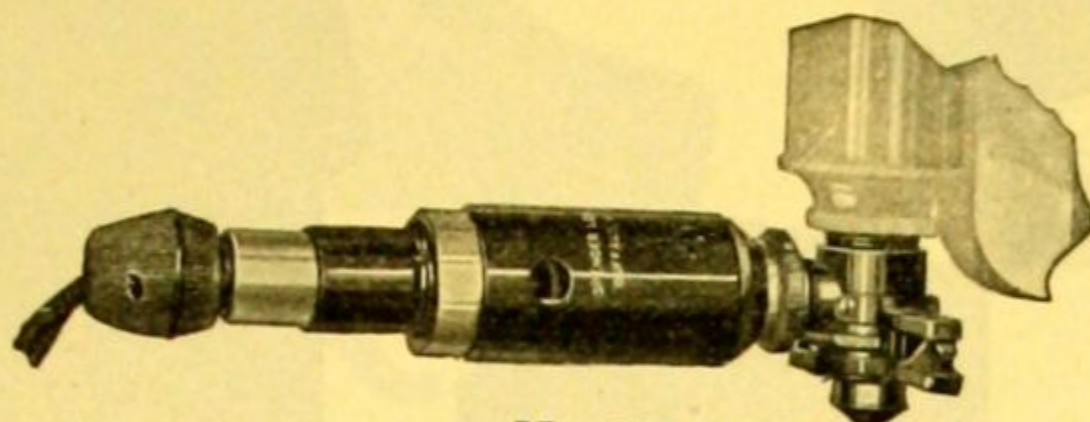
When ordering a sub-stage Dark-Field Illuminator, name the maker, type and, as nearly as possible, the year in which the microscope on which it is to be used, was made; or, better still, send a strip of paper just long enough to circumscribe the sub-stage condenser. This procedure will insure a proper fit.

Our **Biological Stains**, prepared for us by the Coleman-Bell Company, are the result of intensive effort and careful research to produce dyestuffs of great purity for biological use. They are certified by the most rigid chemical and biological tests, insuring to the user the satisfaction and confidence that comes from working with a highly purified product.

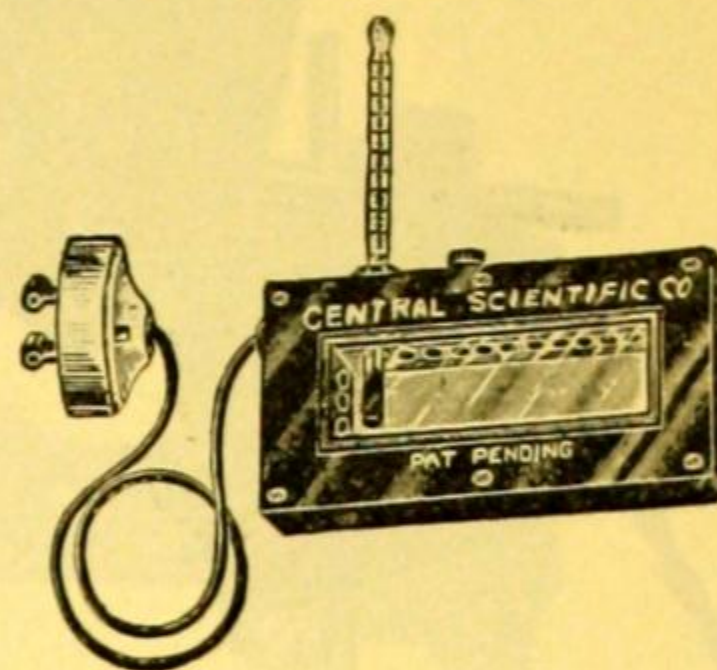
Prices on Nos. 8645, 8646 and 8649 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8652.



No. 8654.



No. 8656.

8652. **ILLUMINATOR, Vertical**, for use on the microscope for illuminating opaque objects. The illuminator is threaded with Society screw threads so that it may be introduced into the optical system of the microscope directly above the objective. It consists of a small prism adjustably mounted in a collar so that light directed on the side opening will be reflected down through the objective on to the specimen from which it is reflected back to the eye through both the objective and illuminator. The opening in the side is arranged so that it can be turned in any direction..... \$12.00

8654. **ILLUMINATOR, Vertical, with attached electric lamp.** Consisting of a No. 8652 vertical illuminator to which is added a tube about six inches in length containing a low voltage electric bulb whose position is adjustable to meet the varying requirements of different objectives. Near the bulb is a disk of finely ground glass which becomes quite brilliantly illuminated. An image of this disk is projected by a condensing lens through the illuminator and objective to the object, giving an even and brilliant illumination over the entire field. An iris diaphragm controls the intensity of the light..... 35.00

8646. **Resistance** for use with No. 8654 to reduce lighting voltage, A. C. or D. C. to 6 volts.

No.	A	B
For volts	110	220
Each	6.00	8.00

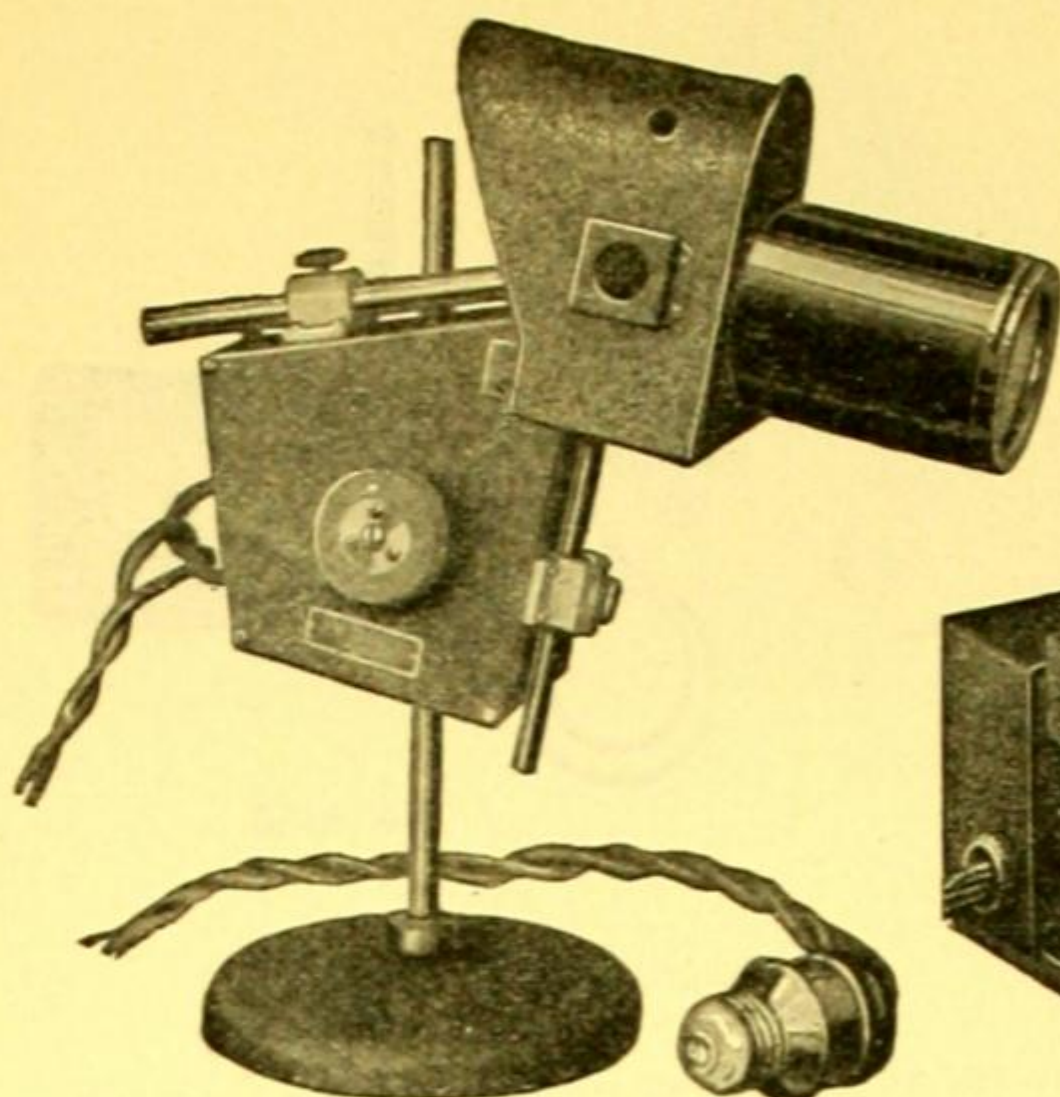
8647. **Lamp, Incandescent, Mazda**, six volts, for No. 8654 Illuminator..... .65

8655. **IMMERSION OIL, Cedarwood**, in 1-ounce vialsper vial .45

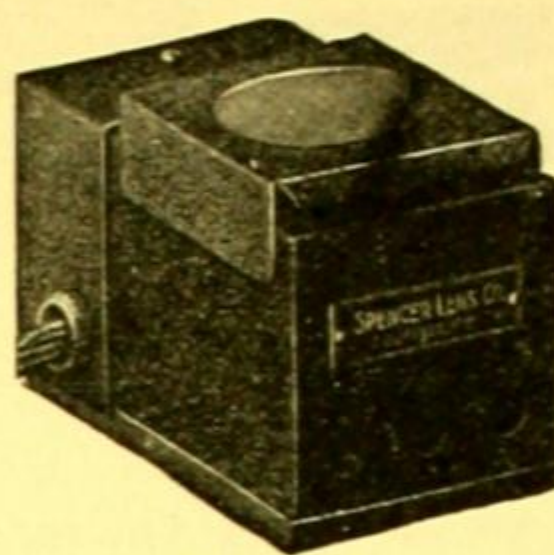
8656. **INCUBATOR, Electric**, for use on microscope stages. Especially valuable in the Widal test, for the cultivation of bacteria, yeasts, spirochetes and tumor cells, and for the observation of malarial parasites. Dimensions, $3\frac{1}{2} \times 2 \times \frac{1}{2}$ inch over all, with incubating chamber $3 \times 1 \times \frac{1}{2}$ inch deep, having a removable glass bottom, consisting of a regular microscope slide. The top is a piece of clear mica with a hole cut through the center through which the lens is passed. A rubber washer is provided for sealing the opening. Complete with heater, thermometer, temperature regulator for any temperature from 80 to 110° F., cord and special plug for attachment to any regular electric lamp socket, in velvet lined case.

No.	A	B
For volts, A. C. or D. C.....	110	220
Each	20.00	20.00

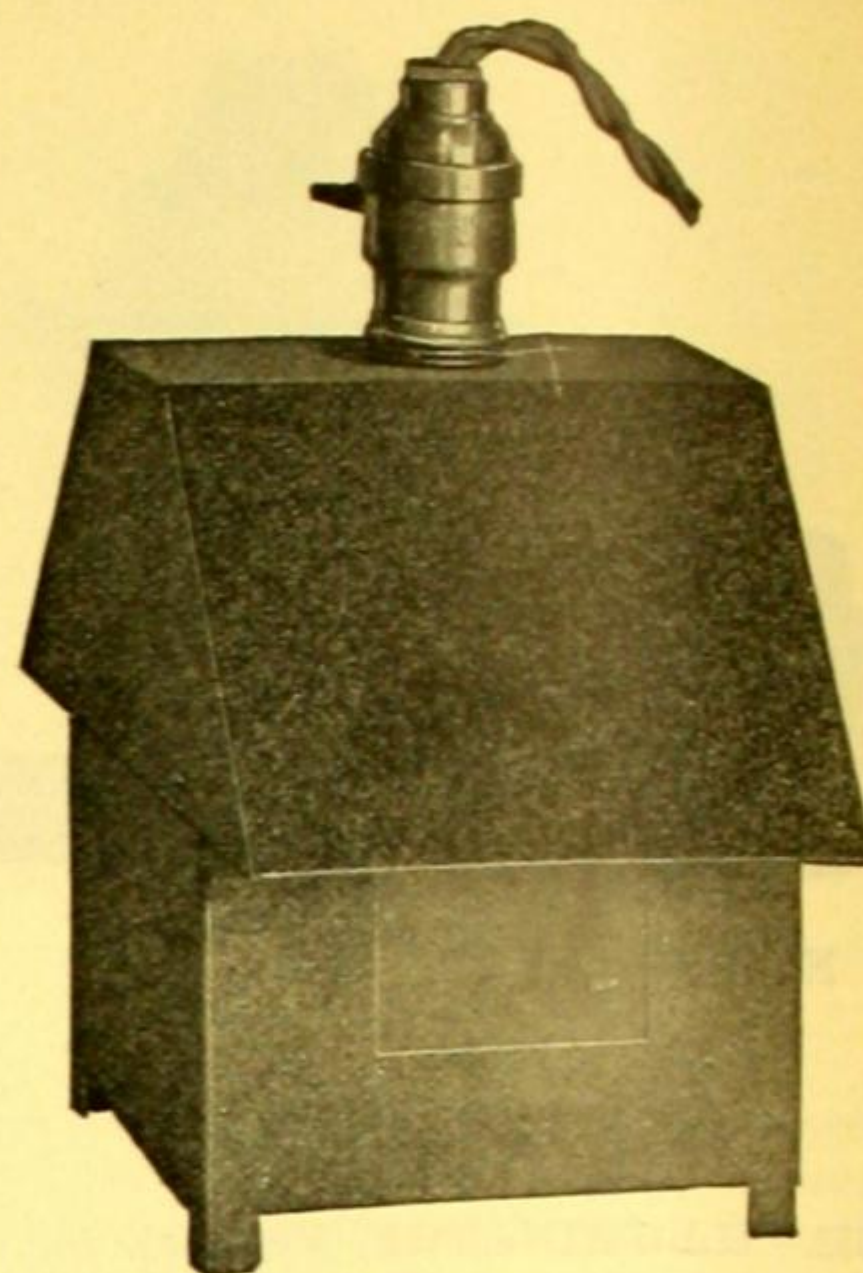
Prices on Nos. 8652, 8654, 8646, and 8647 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8682.



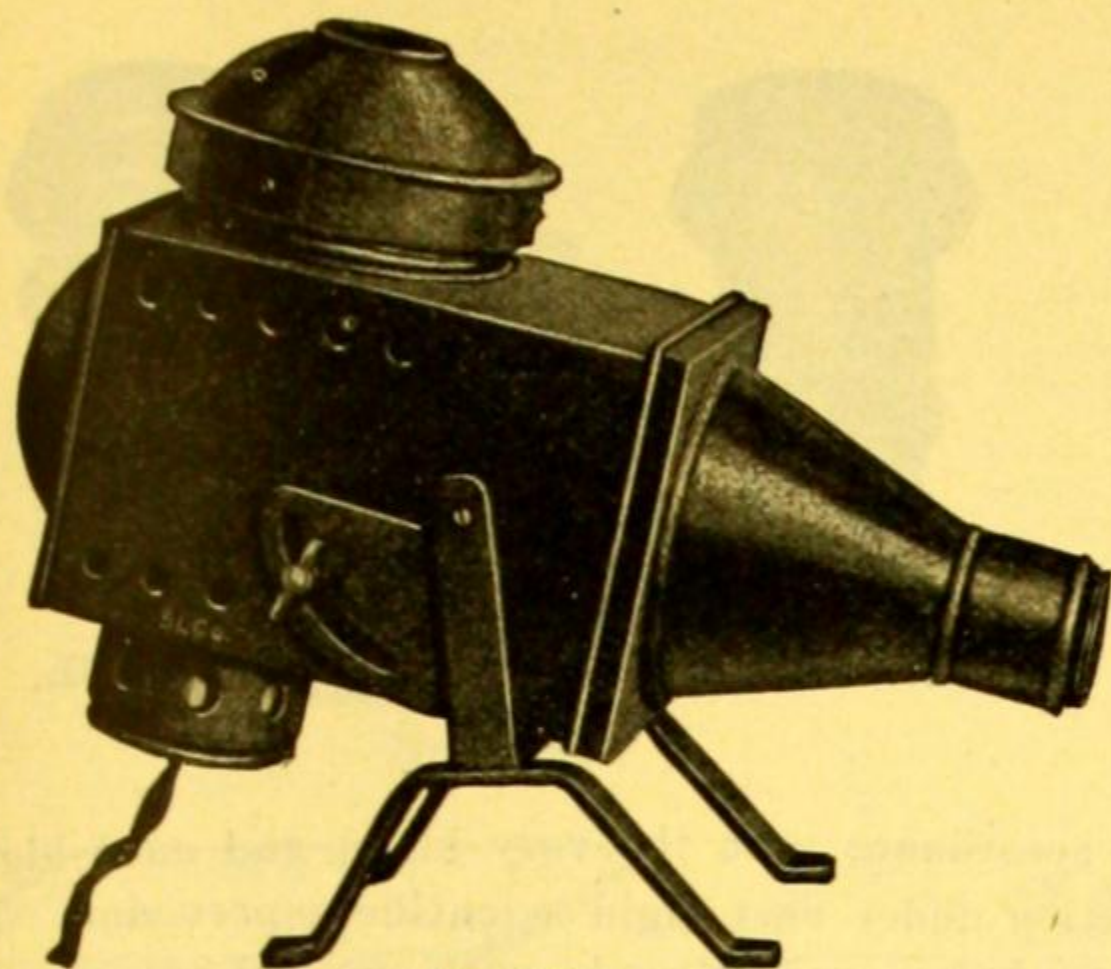
No. 8689.



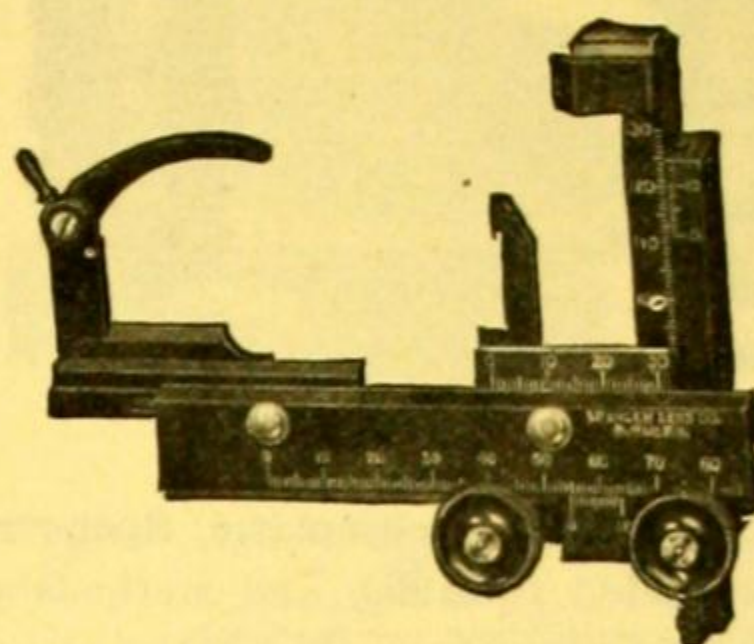
No. 8705.

8682. **LAMP, Hand-Feed Arc**, the most powerful light source for microscopical work. It may be run on any house circuit, either A.C. or D.C., using the proper rheostat. A rheostat must be used to prevent blowing the fuses in the house circuit. The carbons may be moved independently or at the same time. A window is provided for observing the arc. The light rays are focused by means of a condenser in a sliding tube. A blue glass and a ground glass are provided, to fit in a groove in front of the condenser. The lamp is adjustable as to height and angle. Complete with Daylite and ground glass filters, cord and connecting plug but without rheostat or carbons \$23.50
8683. **Rheostats for No. 8682, fixed form, 5 amperes.**
- | No. | A | B |
|-----------|------|-------|
| For volts | 110 | 220 |
| Each | 8.75 | 12.00 |
- F7428A. **Extra Carbons, Solid**, for use with No. 8682 when used on D.C. Length, 6 inches; diameter, $\frac{1}{4}$ inch per dozen .60
- F7428C. **Extra Carbons, Cored**, for use with No. 8682 when used on A.C. Length, 6 inches; diameter, $\frac{3}{8}$ inch per dozen .75
8689. **LAMP, Microscope, Miniature Electric**, small but very efficient, measuring $2 \times 2 \times 3\frac{1}{2}$ inches, low enough to work beneath the substage condenser. It is usually used in this position, it then being necessary to swing the mirror of the microscope to one side. The back and base of the lamp are wood, making its use entirely safe for laying on a polished desk or other such surface. The frame is metal, finished with permanent crystal black which is very durable. The bulb is a 15-watt gas-filled, concentrated filament, and may be used directly on any 110-volt circuit, either direct or alternating. It may be used on 220-volt current with Rheostat No. 8691. A metal reflector behind the bulb concentrates the light and no light can escape except through the single opening. The intensity of illumination is ample for the use of 1.8 mm oil immersion objective and 10x ocular. Complete with five feet of cord and attachment plug, bulb, and Daylite and ground glasses..... 6.50
8690. **Extra Bulbs for No. 8689**..... 1.00
8691. **Rheostat**, for use in series with No. 8689 on 220-volt circuit..... 4.25
8705. **LAMP, Microscope, Chalet Form**, a powerful light source of daylight quality for microscopic examinations and colorimetric determinations following the design suggested by Prof. Simon H. Gage, Cornell University, with the modifications suggested by Dr. H. S. Newcomer, Pennsylvania Hospital, Philadelphia. (See Journal of Biological Chemistry, Vol. 37, No. 3, March 1919.) The illuminant is a 100 watt, 110 volt mazda lamp in a light-tight housing, with projecting eaves to shade the eyes of the worker, and with a window equipped with Corning Daylite glass, 82x82 mm, giving an almost pure white light. The spherical mirror of strong curvature reflects the light from the bulb, which is carried in an adjustable plate for focusing and centering the filament with reference to the mirror reflector. Complete with cord, switch and plug for 110 volt circuit..... 19.50
8706. **Lamp Bulb**, for replacements in No. 8705, 100 watt, 110 volt mazda bulb..... 2.00
8707. **Resistance**, for use with No. 8705 on 220 volt circuit 8.00

Prices on Nos. 8682, 8683, 8689, 8691, 8705 and 8707 subject to 10 per cent. discount to hospitals and educational institutions.



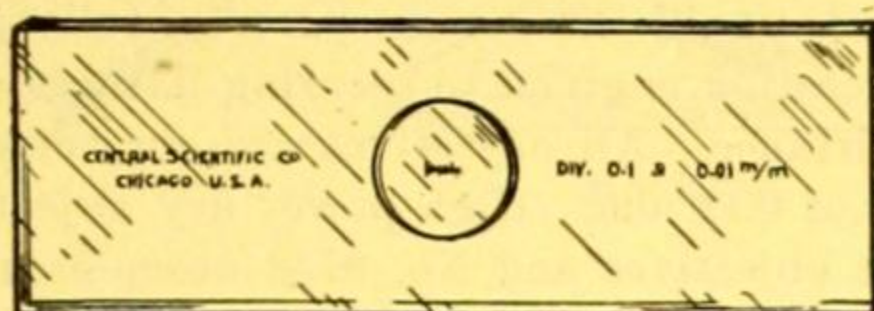
No. 8715.



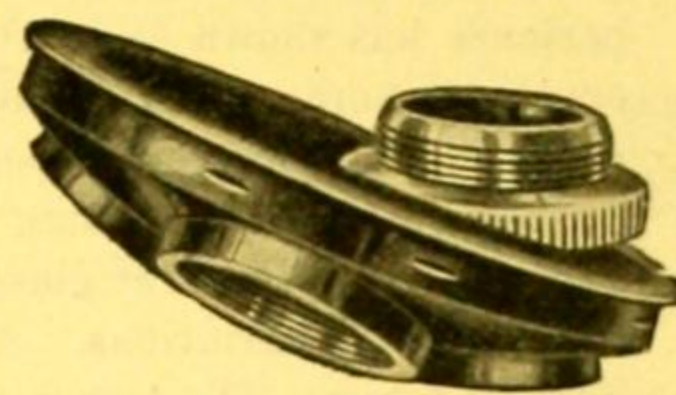
No. 8726.



No. 8730.



No. 8734.



No. 8738.

8715. **LAMP, Microscope, Spencer High Power Mazda**, designed to meet the demand for a very strong beam of light without the objections incident to an arc. Equipped with a Mazda gas-filled concentrated filament bulb, an independent silvered glass reflector of the proper curve, and a pair of 4½-inch condensing lenses which throw a converging beam of light out through the cone. May be tilted at practically any angle. An excellent instrument for use with the dark field illuminator, and for photomicrography. This apparatus with an attachable section and projection objective, forms a very compact and efficient stereopticon. Complete with 400 watt Mazda bulb.

No.	A	B
For volts	110	220
Each	\$27.50	27.50

8726. **MECHANICAL STAGE**, for attachment to the side of any square or rectangular microscope stage by means of screw clamps. A stop at the front always insures its return to the same position on the microscope stage. Should work be interrupted and the mechanical stage be removed, when replaced the object of interest may readily be found, provided the vernier readings have been noted. The verniers are placed slightly to one side on the arm of the microscope for convenience in reading. The movements are by diagonal rack-and-pinion through 40 mm vertically and 85 mm horizontally. Scales are provided, graduated in millimeters, numbered on the centimeter and with verniers reading to 1/10 mm. The range of movement is ample to cover the entire area of the standard 25x75 mm microscope slide. The slide rests upon the surface of the microscope stage and is held in place at one end by an adjustable stop with spring clip, and at the other end by an adjustable stop permitting the use of slides of varying lengths from 55 to 95 mm. Complete in velvet lined case. 27.50

8730. **MICROMETER, Eyepiece**, a glass disk with finely ruled scale to be laid upon the diaphragm of an ordinary Huyghenian eyepiece, with a 5 mm scale divided into 50 parts (to 0.1 mm). 2.00

8731. **MICROMETER, Eyepiece**, same as No. 8730, but with scale divided into 100 parts (to 0.05 mm). 2.50

8734. **MICROMETER, Stage**, for standardizing eyepiece micrometers, consisting of a glass object slide with finely ruled scale, 2.2 mm long. The two millimeter divisions are subdivided into 0.1 mm parts and the two 0.1 mm divisions are subdivided into 0.01 mm parts. 4.50

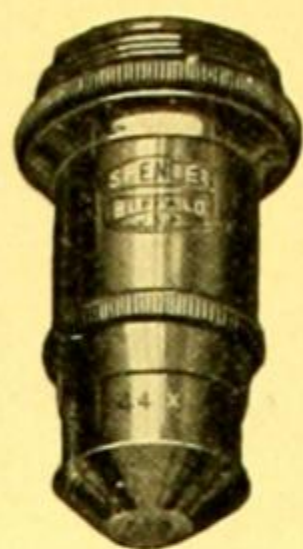
8738. **NOSEPIECES, Revolving**, of the circular type, dustproof. They are valuable accessories when the Microscope is supplied with more than one objective, as they save time and prevent damage and loss of objectives. When ordered with the microscope, objectives are so fitted that they are par-focal.

No.	A	B
Style	double	triple
Each	6 00	8.00

Prices on Nos. 8715, 8726, 8730, 8731, 8734 and 8738 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8746A.



No. 8746F.



No. 8746H.



No. 8746L.

8746. **OBJECTIVES, Achromatic, Spencer**, made in accordance with the very latest and most highly perfected formulae and methods of construction under very rigid scientific supervision. The optical glass from which the objectives are manufactured is made with careful attention to details of both chemical composition and physical control to produce a glass, which long experience has shown to be the most reliable, not deteriorating under any influences of climate or atmosphere; in fact, the permanence of all the optical parts is fully guaranteed. In calculating the formulae especial consideration is given to securing flatness of field, critical definition, resolution and long working distance. All objectives are corrected for a tube length of 160 mm and a cover glass thickness of 0.18 mm. High power dry objectives are very sensitive to these variations. All of these objectives and No. 8738 nosepieces are made with the Society screw. The lenses of the objectives are mounted directly in metal and are thus unharmed when cleaned with a solvent. Nos. H, J and L are for oil-immersion work.

No.	A	B	C	D	E	F	H	J	L
Equivalent focus, mm.....	48	32	25	16	8	4	1.8	1.5	2
Equivalent focus, inches.....	2	1 $\frac{3}{8}$	1	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{12}$
Numerical aperture	0.1	0.1	0.25	0.25	0.50	0.66	1.25	1.25	1.25
Working distance*, mm.....	28	15	9.5	5.0	1.5	0.68	0.13	0.10	0.17
Diameter of real field with 10x ocular†, mm	6.5	4.7	3.3	2.1	1.0	0.36	0.20	0.14	0.16
Magnification with 10x ocular.	22	40	60	100	200	440	950	1090	990
Each	\$6.00	6.00	6.50	6.50	12.00	12.00	40.00	60.00	55.00

*Working distance is the distance between the front lens and the cover glass, when using a 160 mm tube length and a 10x ocular.

†Real field is the diameter of the circular area seen through the microscope and measured in the plane of the object, when using a 160 mm tube length and a 10x ocular.

Magnification Table.

Tube length, 160 mm.

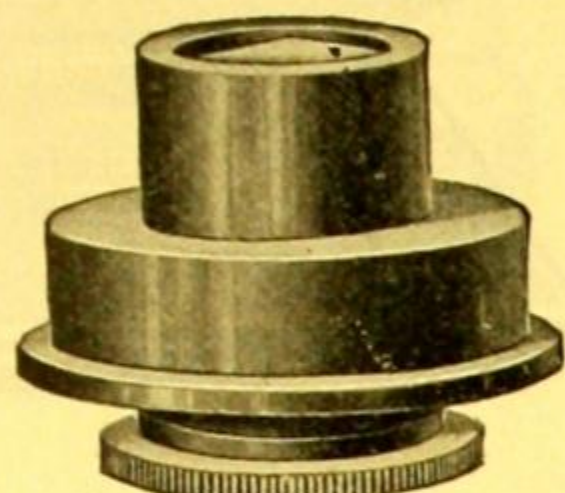
Image distance, 250 mm.

Objectives mm.	Initial Magnifi- cation	HUYGHENIAN OCULARS								Objectives mm.
		4x	5x	6x	8x	10x	12x	15x	20x	
48	2.2	8	11	13	18	22	27	33	44	48
40	2.8	11	14	17	22	28	33	42	56	40
32	4	16	20	24	32	40	48	60	80	32
30-22	2-4.5	4-9	5-12	8-19	10-24	15-35	18-43	20-48	30-70	30-22
25.4	6	24	30	36	48	60	72	90	120	25.4
16	10	40	50	60	80	100	120	150	200	16
12	15	60	75	90	120	150	180	225	300	12
8	20	80	100	120	160	200	240	300	400	8
5	36	144	180	216	288	360	432	540	720	5
4	44	176	220	264	352	440	528	660	880	4
3	60	240	300	360	480	600	720	900	1200	3
1.8	95	380	475	570	760	950	1140	1425	1900	1.8
1.5	109	436	545	654	872	1090	1308	1635	2180	1.5

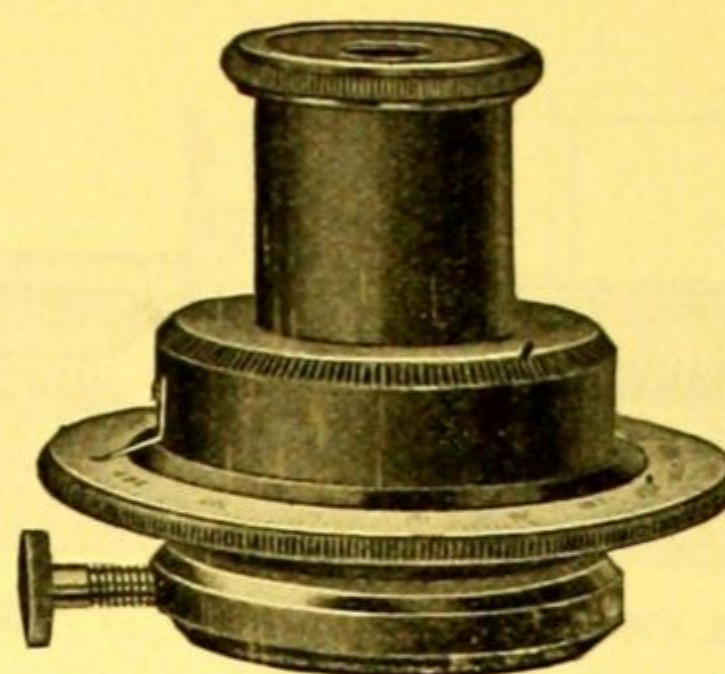
Prices on No. 8746 subject to 10 per cent. discount to hospitals and educational institutions.



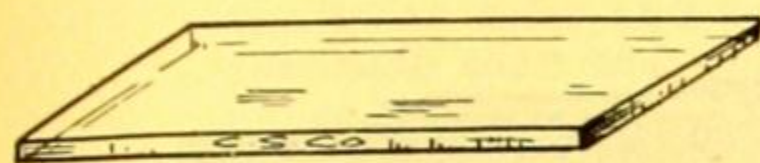
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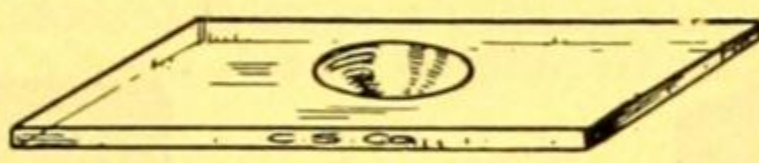
No. 8750.



No. 8754.



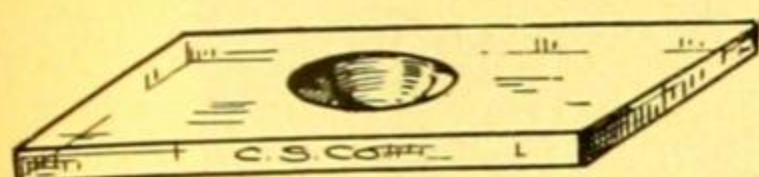
Nos. 8760-64.



No. 8768.



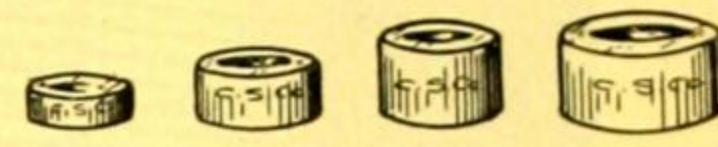
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No. 8776.



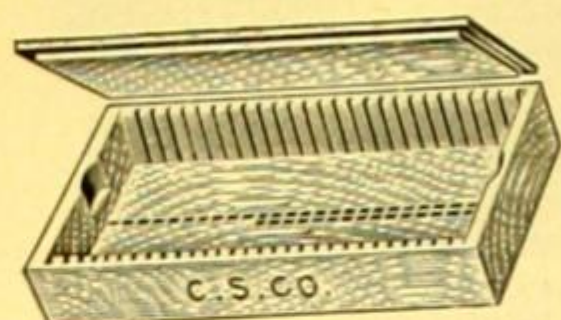
No. 8778.



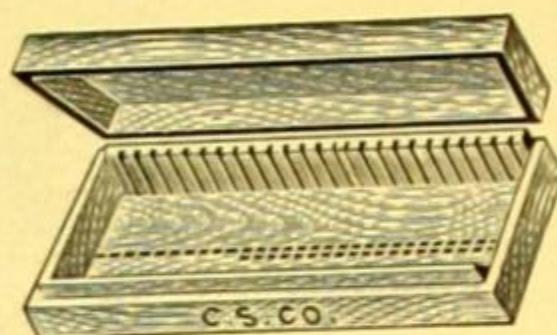
A B C E
No. 8792.

8750. **POLARIZING APPARATUS, Polarizer**, only, for polarizing the beam of light passing through the specimen and optical system of the microscope. Crystalline substances, when illuminated in this manner and viewed through an analyzer such as No. 8754, present a characteristic appearance by which they may be identified. Consists of a polarizing Nicol's prism mounted to revolve freely in a larger mounting designed to be interchangeable with the Abbe condenser \$18.00
8754. **POLARIZING APPARATUS, Analyzer**, only, for use in connection with No. 8750 Polarizer on a compound microscope. Mounted to clamp securely in any position over the ocular of the microscope. A graduated circle around the prism mounting is provided for setting the prism at any desired angle..... 24.00
8760. **SLIDES, Microscope, Non-Corrosive, medium thick, 3x1 inch**, made of hard glass of such a composition that the corrosive effects of moist air will not cause the cloudiness so often experienced with some microscope slides. These slides have a slight greenish tint which does not interfere with their use and for this reason are called half-white. We recommend these slides for general laboratory work of all types. With finely ground edges, in boxes of 1/2 gross. 2.00
- Per gross 10 per cent. discount in lots of 25 gross.
8762. **SLIDES, Microscope, Non-Corrosive, medium thick, 3x2 inches**, same quality as No. 8760, but of larger size. In boxes of 1/2 gross.....per gross 3.20
- 10 per cent. discount in lots of 25 gross.
8764. **SLIDES, Microscope, Extra Thin, white glass, 3x1 inch**. These slides are of pure white glass suitably packed to exclude moisture from the polished surfaces of the slides. They are of uniform thickness with finely ground edges. In boxes of 1/2 gross.....per gross 2.20
- 10 per cent. discount in lots of 25 gross.
8768. **SLIDE, Microscope, Culture, 3x1 inch**, with one polished concave depression in the center of the slide, 18 mm in diameter by approximately 0.8 mm deep.....each 1.10
- 10 per cent. discount in lots of 6 dozen.
8769. **SLIDE, Microscope, Culture, 3x1 inch**, same as No. 8768, but with two depressions..each 1.20
- 10 per cent. discount in lots of 6 dozen.
8776. **SLIDE, Microscope, Culture, 3x1 inch**, of heavy plate glass with one polished concave depression in the center of the slide, 18 mm in diameter by approximately 1.75 mm deep...each .40
8778. **SLIDE, Microscope, Hanging Drop, 3x1 inch**, of heavy polished plate glass, with straight sided circular depression with flat bottom ground in center of the slide. Size of depression 16 mm diameter by 3 mm deep. The bottom of the depression is smooth, but not polished..each .30
8792. **SLIDE MOUNTING CELLS, Glass**. Rings with finely ground edges, for cementing on microscope slides to make cells. No..... A B C E
- | | | | | |
|--------------|-----|-----|-----|-----|
| Diameter, mm | 15 | 18 | 18 | 24 |
| Height, mm | 3 | 5 | 10 | 10 |
| Each | .10 | .12 | .12 | .20 |
- 10 per cent. discount in lots of 100.

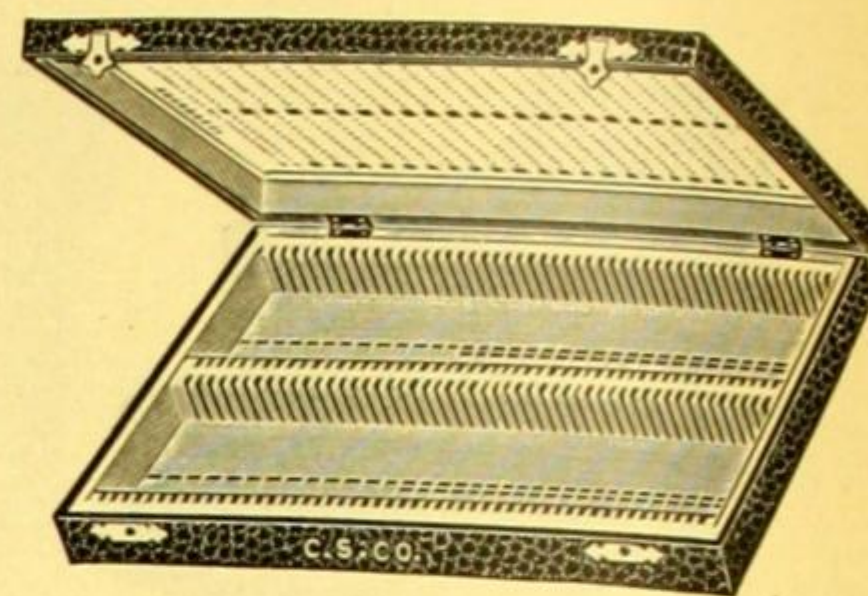
Prices on Nos. 8750 and 8754 subject to 10 per cent. discount to hospitals and educational institutions.



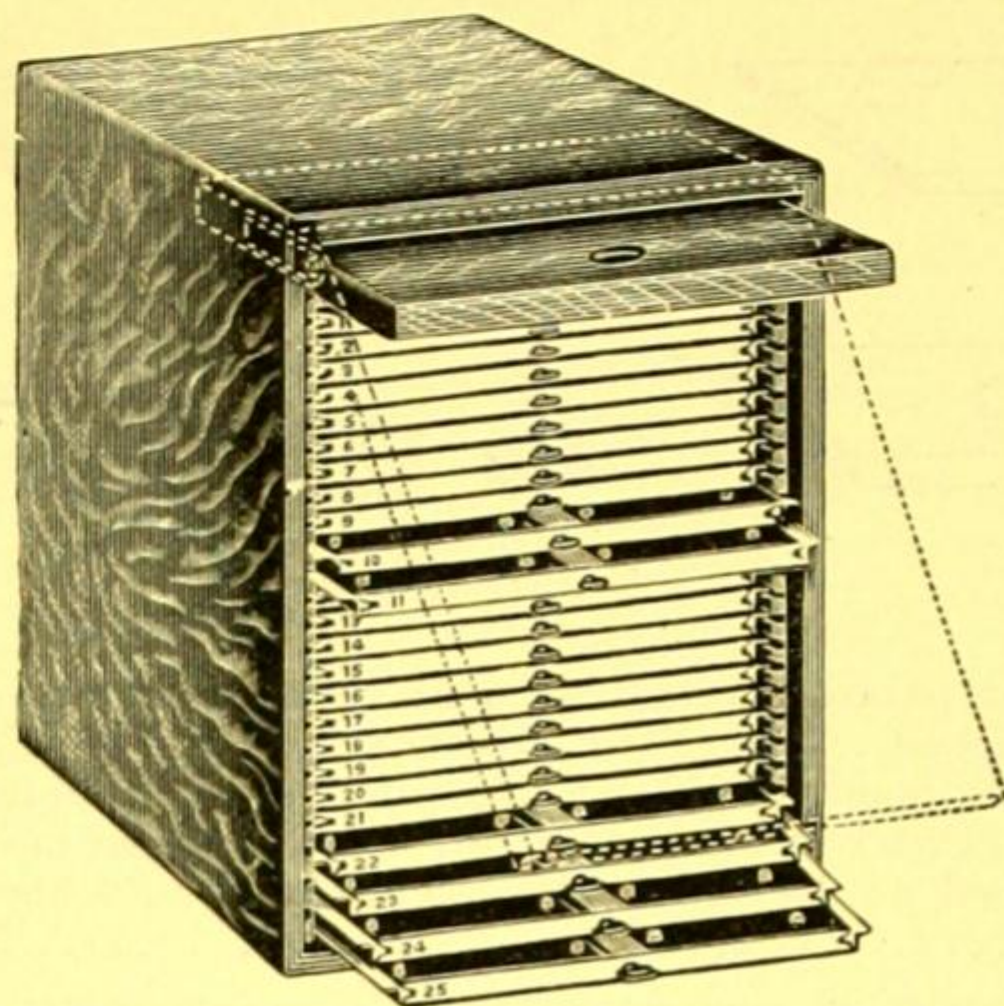
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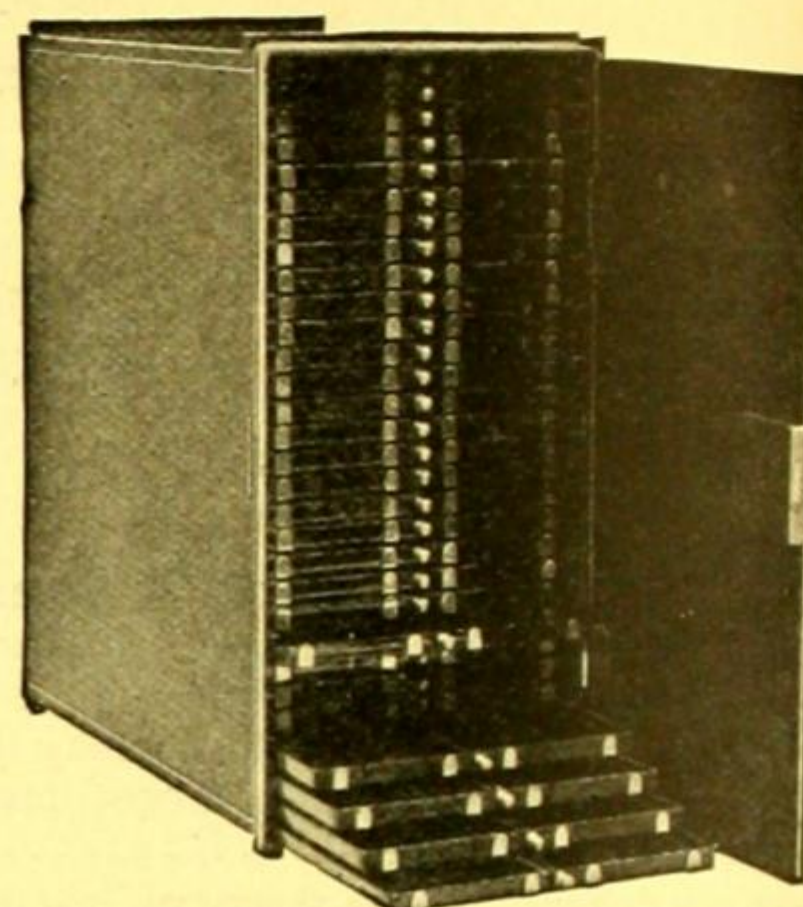
No. 8802.



No. 8804

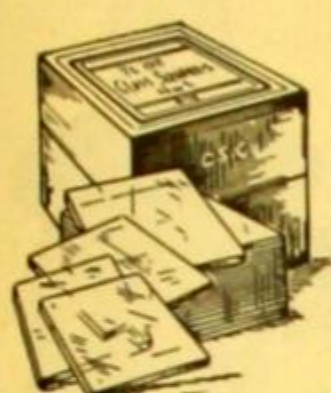


No. 8808.



No. 8810.

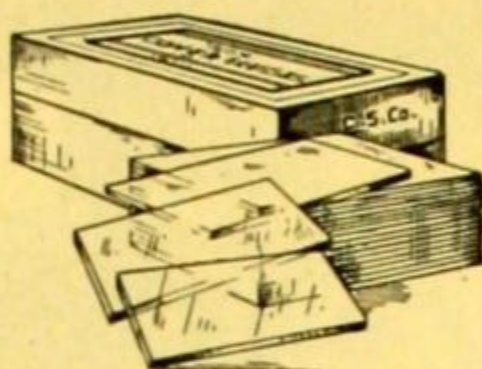
8798. **SLIDE BOX**, of white wood, with covers fitting inside. Grooved to hold twenty-five 3x1 inch microscope slides. Each groove is numbered for listing the slides on the index on the end of the box..... \$0.10
10 per cent. discount in lots of 10. 20 per cent. discount in lots of 100.
8799. **SLIDE BOX**, same as No. 8798, but to hold twelve 3x1 inch microscope slides..... .09
10 per cent. discount in lots of 10. 20 per cent. discount in lots of 100.
8802. **SLIDE BOX**, of white wood, with covers closely fitting over a projecting rim on the box. Grooved to hold twenty-five 3x1 inch microscope slides. Each groove is numbered for listing the slides on the index on the end of the box. This box is of stronger construction than No. 8798 and recommended for purposes where the box will be used constantly..... .15
10 per cent. discount in lots of 10. 20 per cent. discount in lots of 100.
8804. **SLIDE BOX**, of wood covered with bookbinder's cloth, with hinged cover and catch. Holds one hundred 3x1 inch microscope slides in two rows. Each groove is numbered for listing the slides on the printed index on the inside of the cover..... 1.00
10 per cent. discount in lots of 10. 20 per cent. discount in lots of 100.
8808. **SLIDE CABINET, Unit System**, for building up a system of filing slides by placing one cabinet upon another, or side by side as the collection of slides increases. The case is made of quartered oak, well finished and measures 8 1/4 x 12 1/2 x 10 1/2 inches high. The door is constructed to raise up and slide back into the cabinet in the same manner as in a sectional book case. Each cabinet has 25 aluminum trays, numbered so as to be easily located, each tray holding 20 slides, 3x1 inch, in separate compartments, giving a total capacity for the cabinet of 500 slides. The trays are deep enough to hold two slides, one upon the other, in each compartment. If filed in this manner the slides may be separated by rubber bands on the ends of the upper slide. In this manner the capacity of the case is increased to 1000 slides..... 27.50
8810. **SLIDE CABINET, Minot's metal**, a very strong, compact, fire-proof metal cabinet, neatly finished on the outside in maroon-colored japan with bronze stripes. The inside finish is black japan. It has 30 metal trays, each holding 24 slides, 3x1 inch, giving a total capacity of 720 slides. The trays are provided with convenient knobs and with card-holders. The cabinet is furnished with a good lock and measures outside 14 1/4 inches high, 12 3/4 inches deep and 6 7/8 inches wide 42.00



Nos. 8811-12.



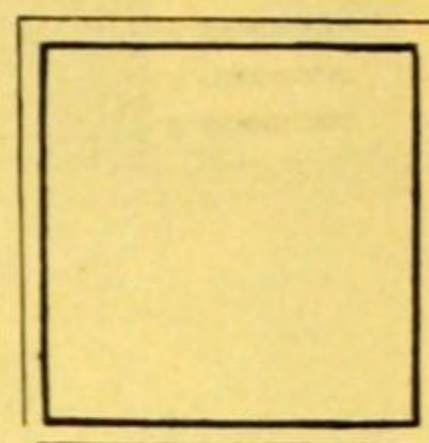
Nos. 8813-14.



No. 8815.



No. 8818.



No. 8176.

8811. **SLIDE COVER GLASSES, Square, No. 1**, thickness 0.13 mm to 0.17 mm, made of the best Saline Glass of uniform thickness. These cover glasses are of a composition, which gives them practically no color and yet enables them to withstand the corrosive effects of moisture with more fortitude than the white glasses rich in metallic silicates, which readily cloud. Packed in ½ ounce boxes.

No.	A	B	C	D
Size, inches	5/8	3/4	7/8	1
Size, mm	15	18	22	25
Approx. number per ounce.....	296	206	150	116
Per ounce	\$1.60	1.60	1.60	1.60

10 per cent. discount in lots of 25 oz. 20 per cent. discount in lots of 100 oz.

8812. **SLIDE COVER GLASSES, Square, No. 2**, thickness 0.17 mm to 0.25 mm, same as No. 8811, but heavier. The optics of compound microscopes are corrected for this thickness of cover glass. Packed in ½ ounce boxes.

No.	A	B	C	D
Size, inches	5/8	3/4	7/8	1
Size, mm	15	18	22	25
Approx. number per ounce.....	234	160	120	92
Per ounce	1.40	1.40	1.40	1.40

10 per cent. discount in lots of 25 oz. 20 per cent. discount in lots of 100 oz.

8813. **SLIDE COVER GLASSES, Circles, No. 1**, thickness 0.13 mm to 0.17 mm, same quality as No. 8811. Packed in ½ ounce boxes.

No.	A	B	C	D
Diameter, inches	5/8	3/4	7/8	1
Diameter, mm	15	18	22	25
Approx. number per ounce.....	360	280	180	140
Per ounce	2.10	2.10	2.10	2.10

10 per cent. discount in lots of 25 oz. 20 per cent. discount in lots of 100 oz.

8814. **SLIDE COVER GLASSES, Circles, No. 2**, thickness 0.17 to 0.25 mm, same as No. 8813, but heavier. The optics of compound microscopes are corrected for this thickness of cover glass. Packed in ½ ounce boxes.

No.	A	B	C	D
Diameter, inches	5/8	3/4	7/8	1
Diameter, mm	15	18	22	25
Approx. number per ounce.....	286	196	156	112
Per ounce	1.70	1.70	1.70	1.70

10 per cent. discount in lots of 25 oz. 20 per cent. discount in lots of 100 oz.

8815. **SLIDE COVER GLASSES, Rectangular, No. 2**, thickness 0.17 mm to 0.25 mm, same quality as No. 8811. The optics of compound microscopes are corrected for this thickness of cover glass. Packed in ½ ounce boxes.

No.	A	B	C
Length, mm	40	50	50
Width, mm	22	22	43
Approx. number per ounce.....	70	50	30
Per ounce	1.40	1.40	1.40

10 per cent. discount in lots of 25 oz. 20 per cent. discount in lots of 100 oz.

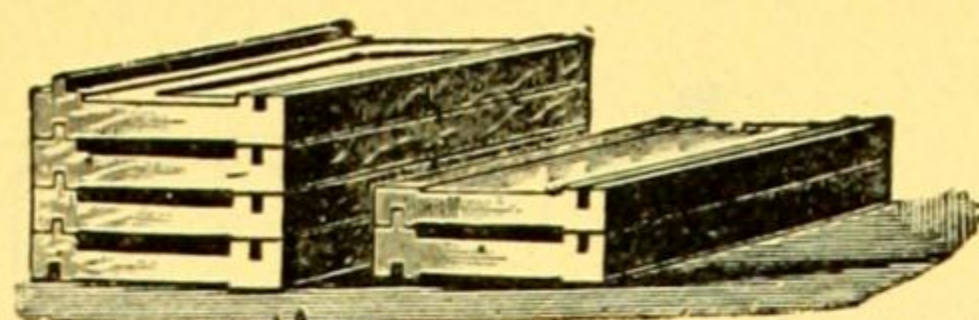
SLIDE DISHES, see Staining Dishes.

8818. **SLIDE HOLDER, Basket Form**, of nicked brass, for use in staining a number of slides simultaneously. Capacity, 12 slides, placed back to back..... 2.00

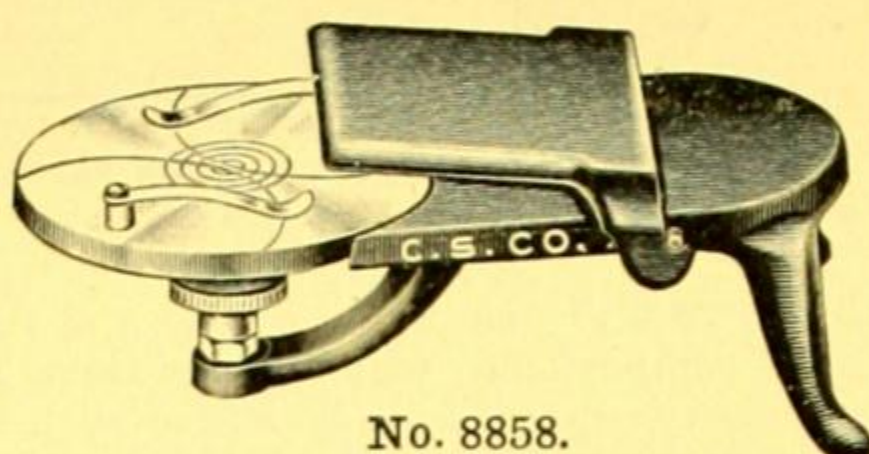
8176. **SLIDE LABELS**, for glass slides, 22 mm square, in boxes of 100.....per box .10

8178. **SLIDE LABELS**, for glass slides, 22x15 mm, in boxes of 100.....per box .10

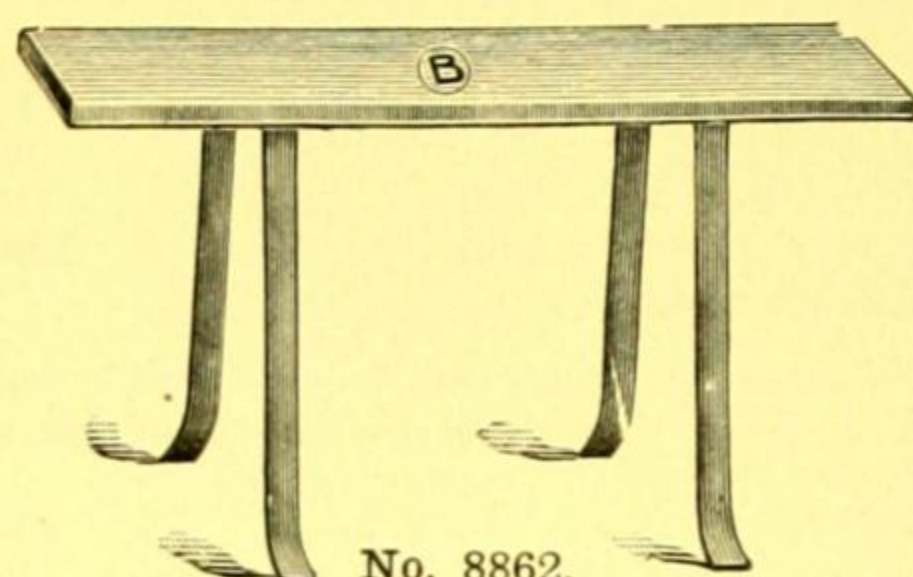
Prices on Nos. 8176 and 8178 subject to 10 per cent. discount in lots of 10 boxes and 20 per cent. in lots of 100 boxes.



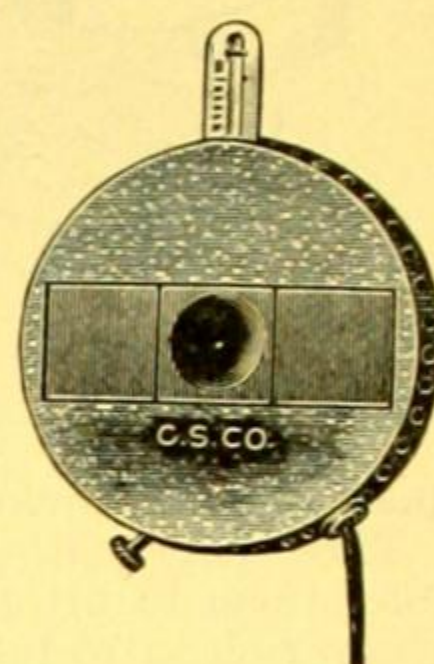
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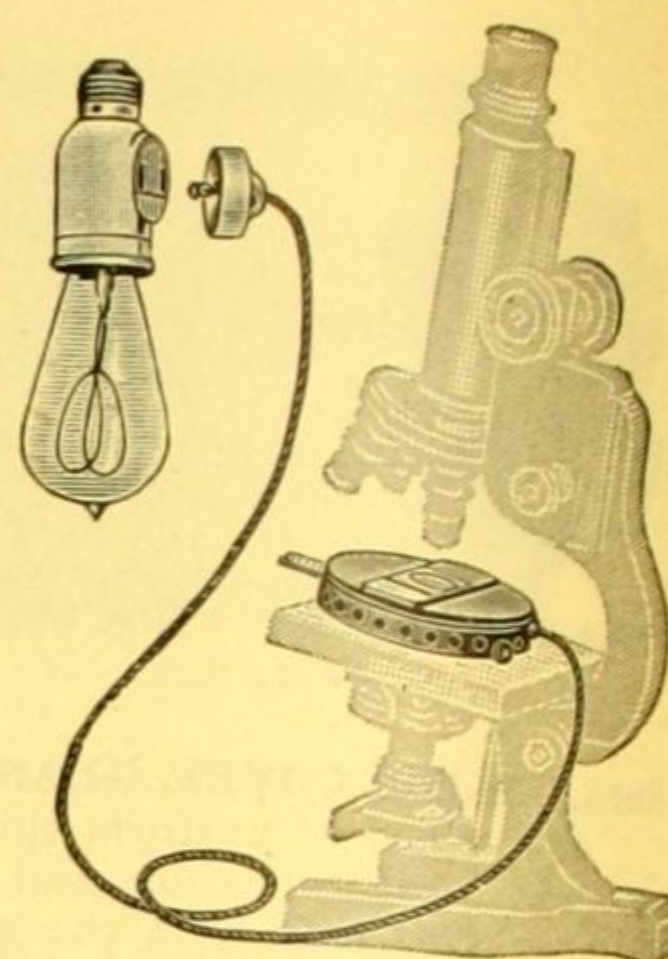
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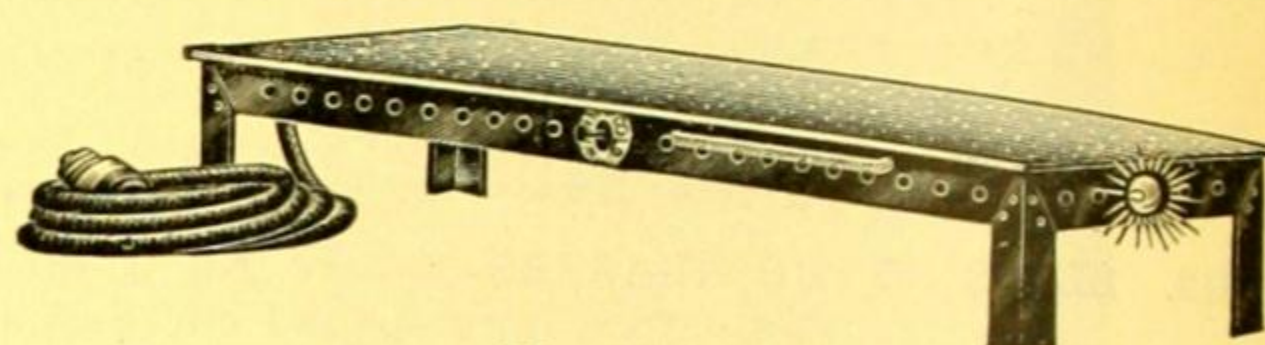
No. 8862.



No. 8852.



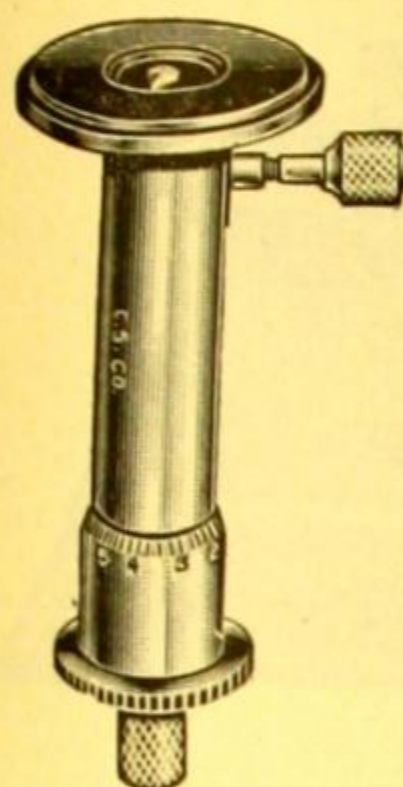
No. 8852 (shown in use)



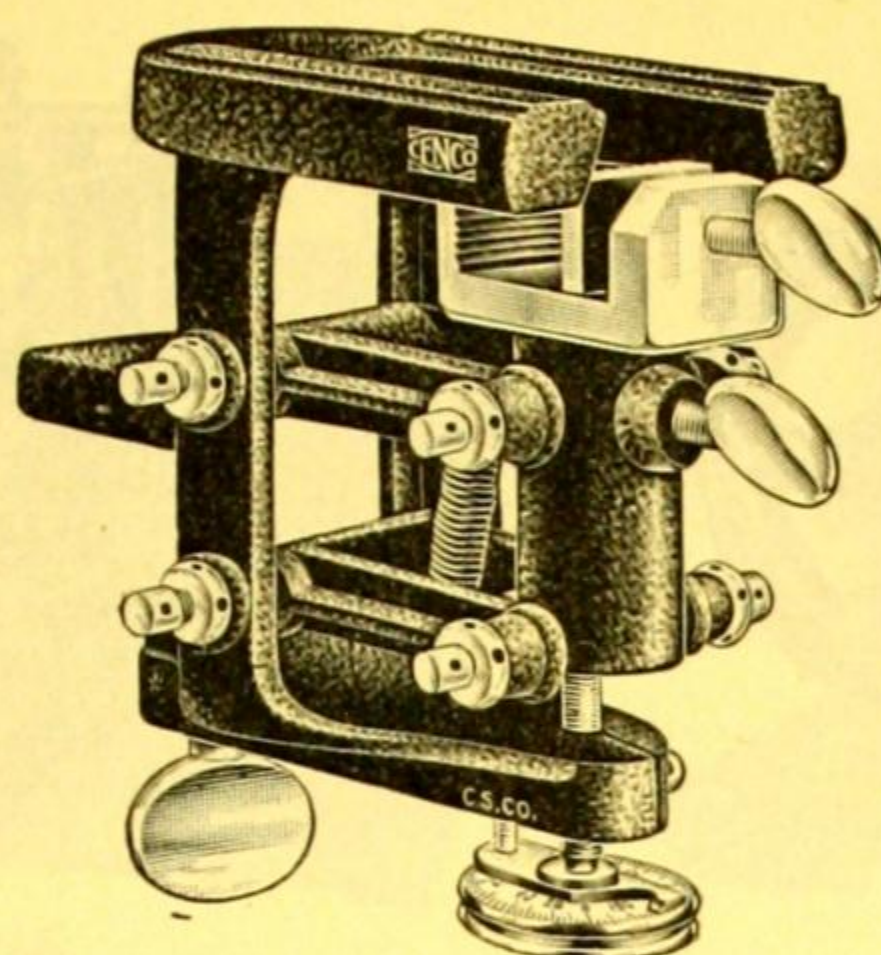
No. 8864.

8833. **SLIDE MAILING CASES**, of wood, for 3x1 inch slides. Very convenient for mailing smears to a central laboratory.....per ten pieces \$0.15
10 per cent. discount in lots of 100.
8852. **STAGE, Warm, Electrically Heated**, for use with any microscope to keep the stage constantly at blood heat or other temperature. With this Warm Stage, micro-organisms may be observed under the microscope in the temperature of their natural habitat. Consists of a circular disk 3½ inches in diameter by ½ inch thick; with heating element, thermometer, and electro-thermostat, which can be adjusted to maintain any desired temperature on the top of the disk. The disk has a ¾-inch hole in the center, over which the regular microscope slide may be placed. Complete with cord and special plug for attachment to any lamp socket.
- | | | |
|-----------------------------|-------|-------|
| No. | A | B |
| For volts, A.C. or D.C..... | 110 | 220 |
| Each | 16.00 | 16.00 |
8858. **TURN TABLE** for ringing mounts. The slide is held on a revolving disk; the application of cement or varnish is accurately made by a brush held above; with self-centering device, detachable hand-rest and clips for holding down slides. Diameter of turn table, 88 mm..... 7.00
8862. **WARMING TABLE, Rectangular**, of copper, for drying and mounting. Length, 350 mm; width, 100 mm; height, 213 mm..... 2.10
8936. **WARMING TABLE, Triangular**, of copper, similar to No. 8862, for drying and mounting. Preferred by many for embedding specimens in paraffine. Length, 400 mm; width at wide end, 190 mm; height, 213 mm. With removable legs 3.75
8864. **WARMING TABLE, Electrically Heated and Regulated**, for warming slides in mounting paraffine sections. Can also be used in fixing and hot staining. Constructed of a block of transite 24 inches long and 6 inches wide, mounted on a metal frame 3 inches high. A series of resistance coils embedded in the transite furnishes the heat, the degree of which is controlled by a thermo-regulator adjusted by a small knurled head at the side. A pilot lamp indicates when the current is on and off. Any temperature can be obtained from 30° to 70° C. Shipping weight, 33 pounds. Complete with metal hood to protect slides from dust, thermometer, connecting cord and plug for attachment to any 110-volt lamp socket..... 40.00

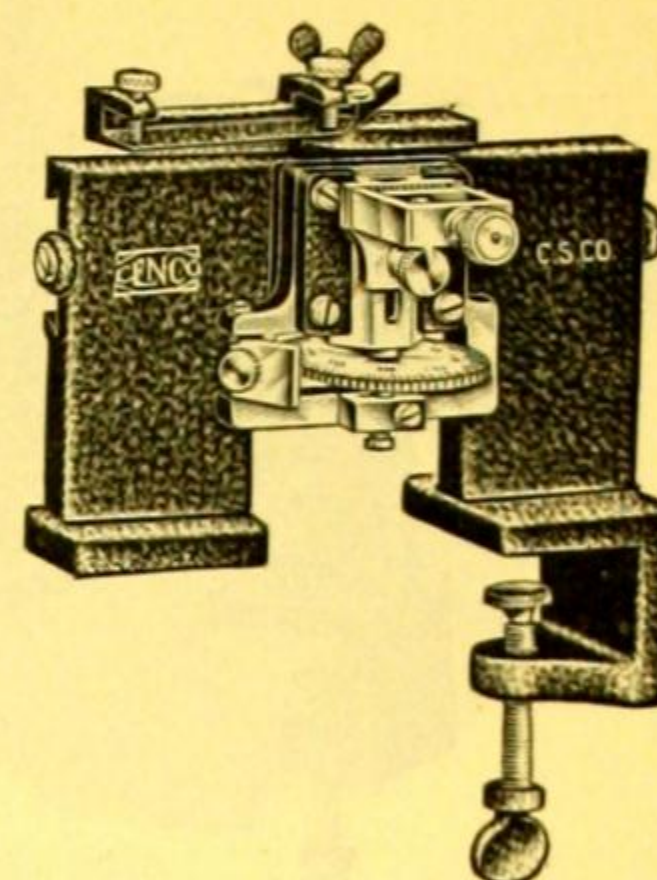
All of the Microscopes and Microscope Accessories, which we list, are carried in our Chicago stock priced on exactly the same basis, including the preferential discount allowed educational institutions and hospitals on certain items, as the factory prices. Our shipments are made F. O. B. Chicago, we absorbing the transportation charges from the eastern factories. Mid-west and western purchasers will therefore make a considerable saving by purchasing these standard items from our Chicago stock.



No. 8880.



No. 8884.

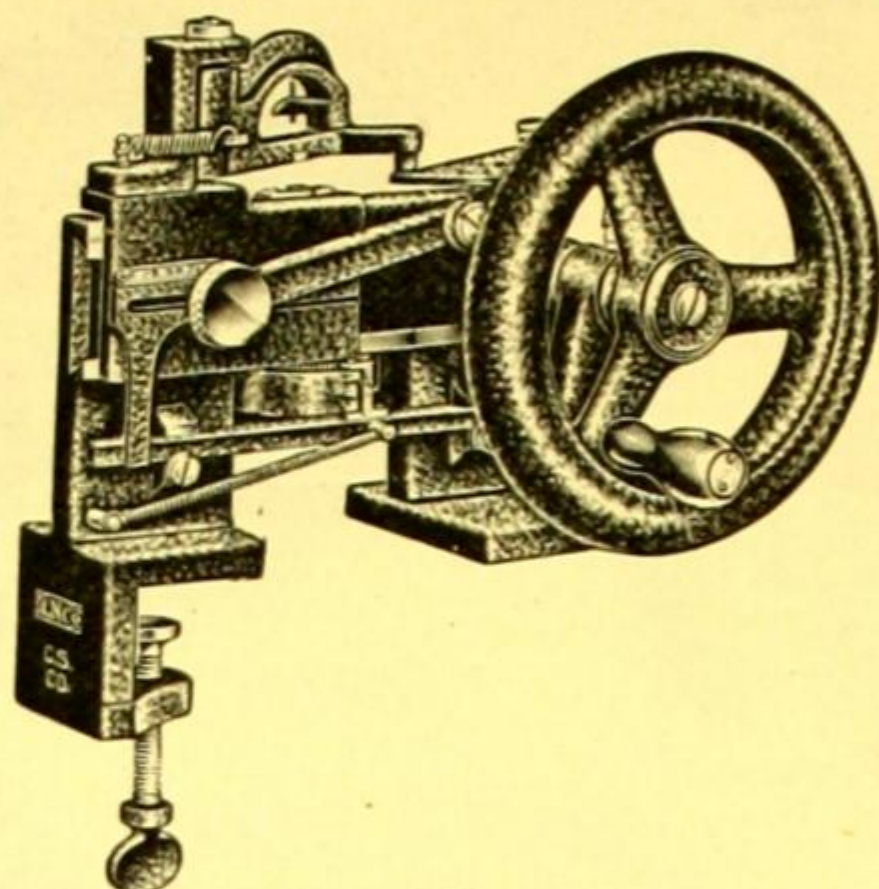


No. 8888.

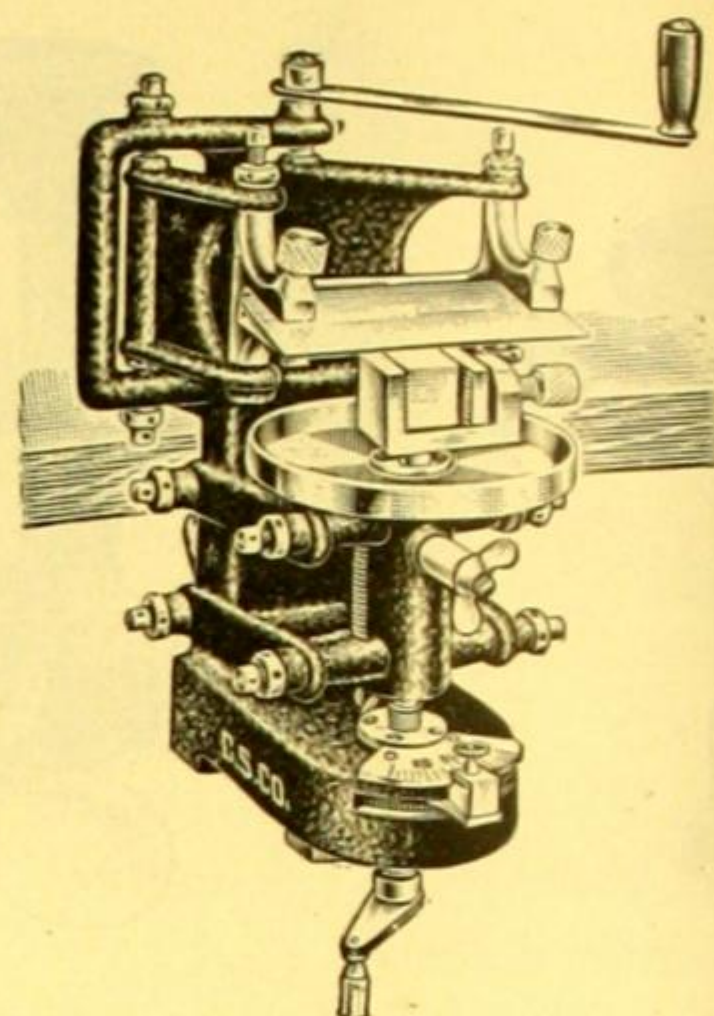
MICROTOMES

8880. **MICROTOME, Hand**, a compact, portable microtome for rapid free hand sectioning. Specimens up to 12 mm in diameter are placed in a clamp in the upper end of the instrument and are raised through the opening in the circular glass table by an accurately cut screw, which is entirely enclosed in the handle for protection from injury and dust. The screw is operated by means of the knurled head on the lower end of the handle. A graduated drum divided into 10 micron divisions enables accurate cutting of sections. The glass table at the top is 75 mm in diameter providing a large firm support for the knife or razor. Any section knife or razor can be used with this instrument. **Without knife or razor**..... \$10.00
8884. **MICROTOME, Table**, for free hand sectioning of either embedded or frozen specimens measuring up to 30 by 22 mm. The object clamp is placed in a vertically movable socket, held by hardened steel pivot screws in two vertically swinging arms, which are similarly attached to the main frame. The movement thus provided for is regulated by a micrometer screw, with graduated disk and index plate. Each division of the graduated disk is equivalent to an advance of the specimen of $2\frac{1}{2}$ microns. The knife travels on glass ways set in grooves in the metal of the frame. These plates are extra long, so that the knife will not be drawn off from the ends, thereby endangering its edge. Microtome knife No. 8966 is especially designed for use with this instrument, but any knife or razor with a cutting edge of over 75 mm can be used. When equipped with a freezing attachment, it makes a very satisfactory microtome for frozen section work (see No. 8886). A screw-clamp is provided for firmly attaching to the laboratory table. **With object clamp, but without knife or razor**..... 18.00
8886. **MICROTOME, Table**, same as No. 8884, but with No. 8942 Freezing Attachment for freezing with ether in place of the object clamp. **Without knife or razor**..... 24.00
8888. **MICROTOME, Simplified Sliding Carriage**, with cutting and feeding mechanism operated by hand. Especially adapted for the rapid, but accurate cutting of objects embedded in celloidin or paraffin, and when equipped with a No. 8941 Freezing Attachment, frozen sections may be cut with equal facility. The object is fed by rotating the ratchet wheel, each tooth representing 5 microns. The object clamp of one piece, is extremely rigid; when fully extended, it takes objects 30 by 22 mm. The knife is firmly held in an adjustable knife holder. For cutting frozen or celloidin sections the knife holder and knife are set at an angle while for paraffin they are set at right angles to the direction of movement. A plain microtome knife 90 mm or more in length is used on this instrument (see No. 8958AA). The metal frame is very substantially constructed in one piece, and is provided with a clamp, which enables the instrument to be attached firmly to any table. Finished in crystal black and nickel plate. **Without knife** 47.00
8889. **MICROTOME, Simplified Sliding Carriage**, same as No. 8888, but with No. 8941 Freezing Attachment for freezing specimens with liquefied carbon dioxide gas, instead of the object clamp. **Without knife** 53.50

Prices on Nos. 8880, 8884, 8886, 8888 and 8889 subject to 10 per cent. discount to hospitals and educational institutions.



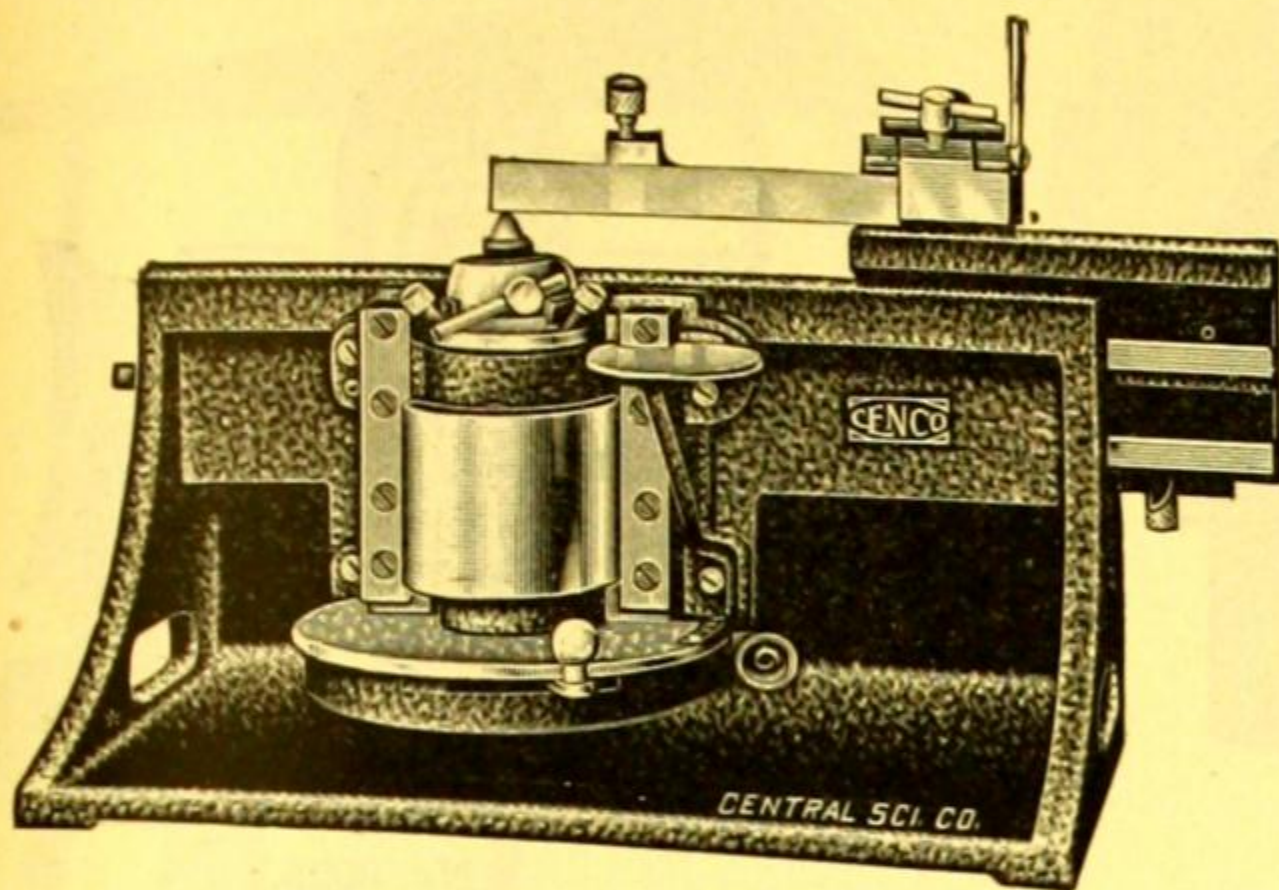
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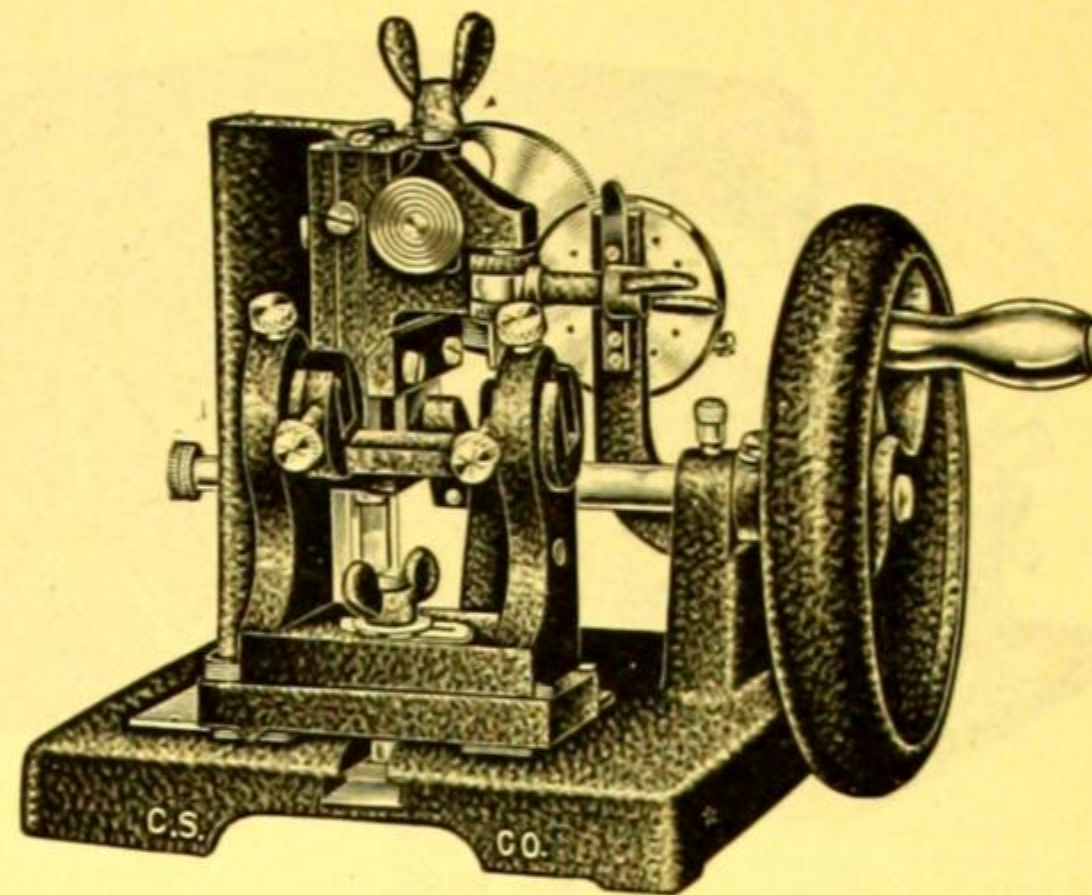
No. 8910.

8893. **MICROTOME, Automatic, Sliding Carriage**, with the cutting and feeding mechanism operated simultaneously by a wheel driven reciprocating movement, which facilitates rapid sectioning. A cam plate which may be set at varying angles to the slide, guides the knife carriage in an oblique direction, causing the knife to move in a curve when cutting the specimen, thus bringing the entire cutting edge of the knife into action with a draw stroke movement through the specimen, making the instrument particularly desirable for the cutting of frozen and celloidin sections. The knife can be set at right angles to the direction of motion for paraffin sectioning. The object clamp when fully extended takes objects 30 by 22 mm. The feeding mechanism provides for cutting of 5 microns or more, single divisions of the graduated wheel representing 5 microns. A plain microtome knife, 90 mm or more in length, is used on this instrument (see No. 8958AA). The metal frame of the instrument is very substantially constructed in one piece, and is provided with a clamp, which enables the instrument to be attached firmly to the table. **Without knife**..... \$87.00
8895. **MICROTOME, Automatic, Sliding Carriage**, same as No. 8893, but with No. 8941 Freezing Attachment for freezing specimens with liquefied carbon dioxide gas, instead of the object clamp. **Without knife** 93.50
8910. **MICROTOME, Automatic, Swinging Carriage**. The peculiar motion of the knife makes this microtome especially desirable for cutting celloidin and frozen sections, when equipped with No. 8940 Freezing Attachment for freezing with liquid carbon dioxide, but is not so well suited for paraffin work. The extreme ends of the knife rest in the carrier, and, as the lever handle moves the swinging arms the knife describes a flattened curve, corresponding to the double movement of free hand sectioning. By this manner of holding the knife by arms which are not parallel, the entire length of its cutting edge is utilized, insuring uniform wear and permitting the cutting of very large sections. Plain microtome knife No. 8958B, 110 mm length is used with this instrument. The object clamp will take objects 30 by 22 mm. The automatic feed mechanism consists of an accurately cut ratchet wheel, keyed to the vertical feed screw, in the teeth of which a hardened steel pawl engages. By means of a lever extending to the graduated scale on the front of the main frame base, this pawl may be thrown out of action or it may be set to cut sections of any desired thickness. Each division of the graduated scale marks 5 microns. The drip pan is intended for use with the object clamp, as shown in the illustration, when celloidin sections are cut. It is best to remove this drip pan when cutting frozen sections. **Without knife** 73.00
8912. **MICROTOME, Automatic, Swinging Carriage**, same as No. 8910, but with No. 8940 Freezing Attachment for liquid carbon dioxide instead of the object clamp. The rapidity with which frozen sections may be made with this equipment recommends it highly for operating room use. Sections may be cut, stained and mounted in 1½ minutes from the time the tissue is placed on the freezing plate. In operating the freezing attachment, the valve on it is first closed and the valve at the cylinder slightly opened to admit gas into the connecting tube. Then, by opening and closing the valve on the attachment three or four times in quick succession, the tissue is frozen without any waste of gas or inconvenience caused by condensed moisture freezing in the chamber and clogging the system. **Without knife** 83.50

Prices on Nos. 8893, 8895, 8910 and 8912 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8915.



No. 8919.

8915. **MICROTOME, Automatic Sliding Carriage, Precision Model**, embodying all of the three elements vital to accurate sectioning; viz., absolutely rigid object support, inflexible knife support and precisely accurate feeding device. This combination has produced an instrument suitable for the most accurate paraffin work, and, on account of the long draw of the knife, an instrument par excellence for celloidin cutting and wood sectioning. When equipped with the No. 8917 Adapter and the No. 8940 Freezing Attachment for freezing with liquid carbon dioxide, it is a most efficient frozen section microtome. The foundation for the above qualities is an easily-handled substantial base casting patterned to resist all strains. It is 350 mm by 170 mm by 175 mm high. The knife block is 150 mm long cast of hard bronze which makes the best bearings against the cast iron of the slide ways. The excursion of the knife block is 300 mm which provides for the use of the longest knives set at an extremely acute angle to the line of movement. Plain microtome knife No. 8958C of 185 mm length is used with this instrument. The large feed screw (12 mm in diameter) is directly beneath the center of the object clamp which is the standard ball and socket mechanism that has proven its superiority for rigidity and adjustability on the No. 8922 Rotary Microtome. This together with the large heavy solid nut (12 mm in thickness), provides absolutely against any springing downward of the object clamp. The feeding mechanism consists of an accurately cut screw actuated by a disk having 250 notches in its periphery, each notch advancing the specimen 2 microns. Sections can be cut from 2 to 40 microns in thickness by multiples of 2 microns through 28 mm with one setting of the specimen. In setting the instrument for a desired thickness it is only necessary to turn a milled head until the pointer reaches the proper designation on the graduated arc. The whole feeding mechanism, including the automatic parts, is enclosed. Attached to the support for the object clamp is a convenient and easily removable receptacle to catch the drippings from the specimen when alcohol is used in the sectioning. **Without knife clamp or knife..... \$129.50**

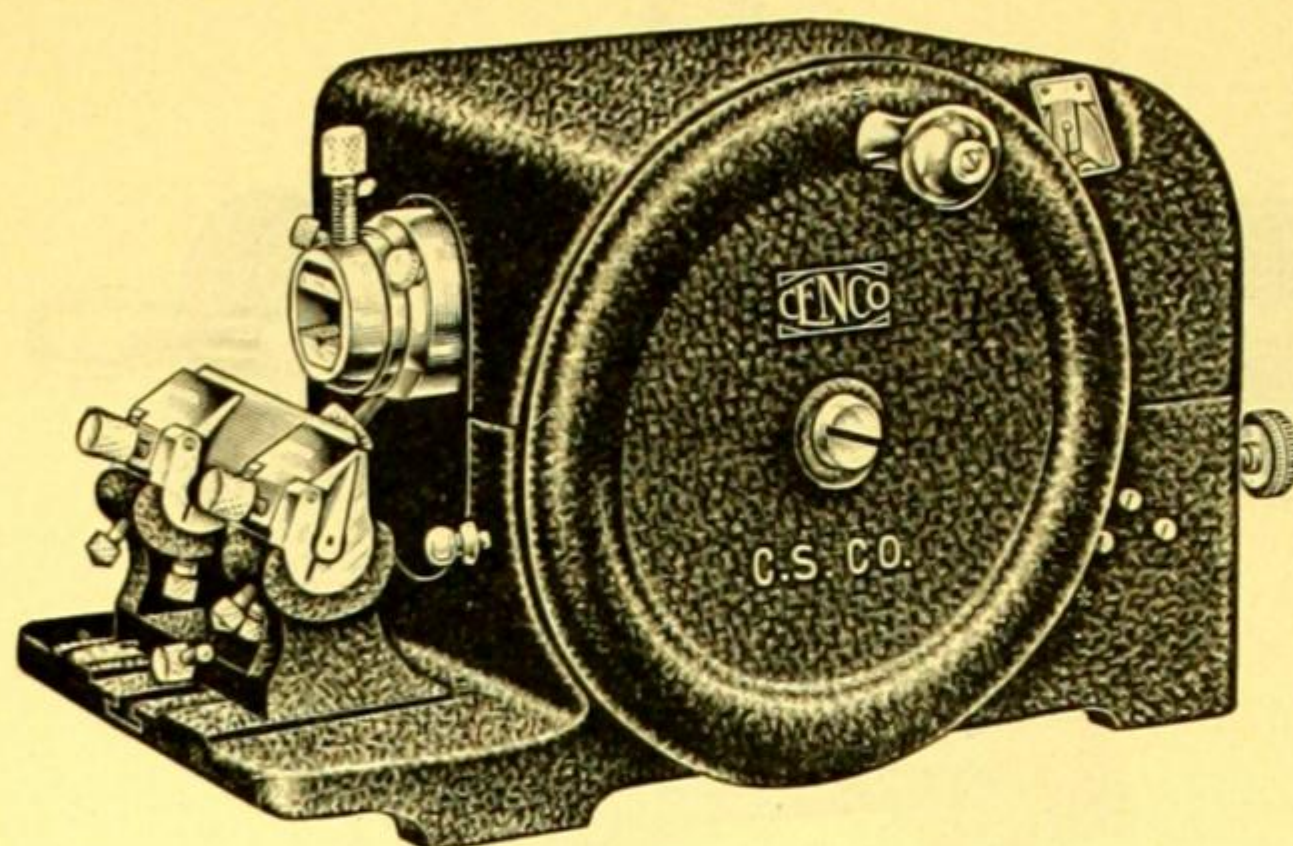
8916. **Knife Clamps**, for use with No. 8915. Clamp A is the one ordinarily used. Clamp B is used with knives 150 mm or more in length and provides for clamping the knife at both ends.

No.	A	B
Length, mm	50	140
Each	6.00	10.00

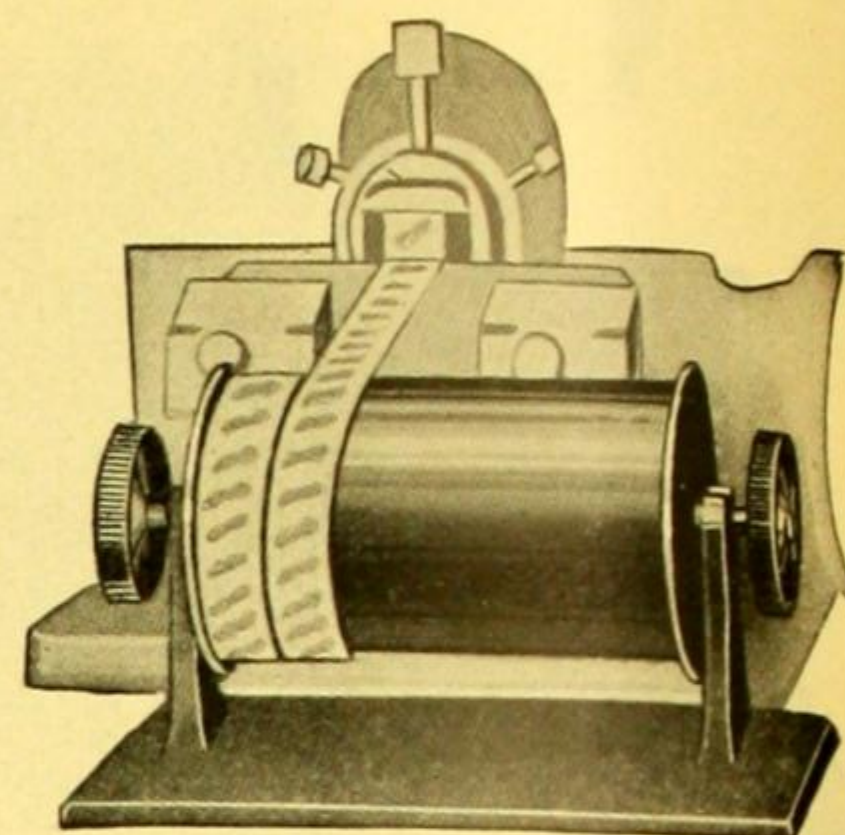
8917. **Adapter for CO₂ Freezing Attachment**, to permit the use of the No. 8940 Freezing Attachment with No. 8915..... 4.00

8919. **MICROTOME, Minot Simplified Rotary**, designed in accordance with the wishes of the late Dr. Charles S. Minot, of Harvard University, for an instrument having the efficiency of the more elaborate rotary microtomes, but of simpler construction. The feeding mechanism operates automatically and may be adjusted to cut any thickness from $2\frac{1}{2}$ to 25 microns. The object holder consists of a disk 25 mm in diameter which moves on a vertical slide actuated by a crank operated by a heavy balance drive wheel. The knife block consists of a heavy iron casting which is attached to the base and holds the knife in a fixed position, adjustable to and from the object and from side to side to permit the use of nearly the entire cutting edge. It may also be tilted in its support to set the angle of the cutting edge as desired. A plain knife 125 mm long is used on this instrument (see 8958BB). The base measures 196 mm by 212 mm. With three object disks but **without knife..... 82.50**

Prices on Nos. 8915, 8916, 8917 and 8919 subject to 10 per cent. discount to hospitals and educational institutions.



No. 8922.



No. 8925.

8922. **MICROTOME, Precision Rotary, Spencer**, intended for the most accurate and careful work. An inclined plane feed, which is independent of the up-and-down movement on the perpendicular support, overcomes the inaccuracies inherent in other rotary microtomes. The provision of an accurate and reliable feed mechanism, combined with the utmost rigidity of parts, make this instrument the most precise and accurate for laboratory or research work. Sections may be cut of any definite thickness, each section having the same thickness.

The feed mechanism is composed of a rigid bearing, on which the feed block is moved by an accurate screw, cut with two threads to the millimeter; it is revolved by a ratchet feed wheel with 250 teeth; each tooth represents therefore a movement forward of the object of one micron. The feed is so arranged that it can be set for sections of any thickness, from 1 micron to 60 microns, by turning the knurled button at the back of the case until the number representing the desired thickness appears opposite the indicator at the small opening in the side of the case near the balance wheel. The total excursion of the feed is 37 mm, allowing a sufficient range for cutting a complete series of a very large object without the necessity of a break due to resetting the knife and feed mechanism.

The up-and-down stroke of the object clamp is 50 mm which permits the cutting of very large sections and gives sufficient stroke for celloidin cutting. The clamp may be held at its upper limit for orienting or trimming the block by pushing in a pin. The object may easily be rotated.

The knife is fastened by two clamps, each of which clamps the knife at the back and along $1\frac{1}{4}$ inches of the edge as well. It may be turned to any desired angle, and the clamps may also be moved toward one another to bring them as near to the ribbon as desired to gain additional rigidity. When the clamps are thus drawn together, the knife may be moved so that practically all of the cutting edge can be used before the necessity of resharpening. The adjustment screws provide for knives of different widths. The whole knife support is adjustable to and from the object, and is very easily and conveniently clamped in any location by a lever connected with an eccentric cam. Specially ground knives Nos. 8960A and B are required for use with this instrument.

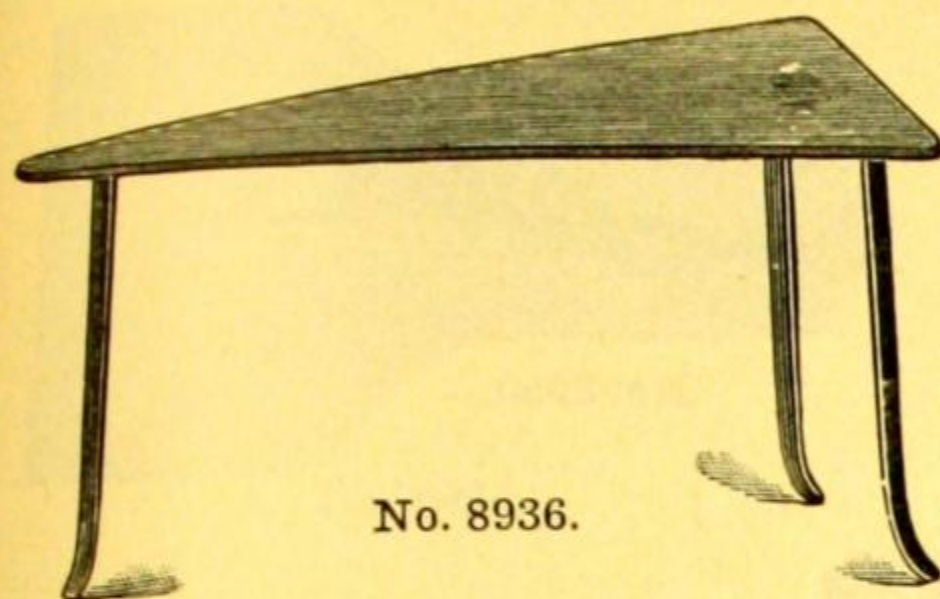
The whole of the feeding mechanism is covered, protecting the wearing parts from dust and presenting a very neat appearance. The top of the case is hinged to the lower part, permitting it to be easily opened. The balance wheel is grooved, so that the instrument may be run by a motor. The whole microtome is finished in crystal black, alcohol-proof enamel. The smaller parts are heavily nickel-plated.

When desired, the microtome is provided with an adjustable knife support which is especially adapted to celloidin sections. The knife holder of this support is adjustable from a horizontal position through 55° upward. Complete with three object disks but without knife....\$166.50

8923. **Knife Holder** for No. 8922, for celloidin sections 20.00

8925. **RIBBON CARRIER, Spencer Cylindrical**, for use with No. 8922, consisting of an aluminum cylinder mounted in an aluminum frame, under the base of which are small rollers, rolling in the direction of the long dimension of the frame. The end of the ribbon adheres to the cylinder, which is slightly turned by the knurled heads shown in the illustration as the ribbon lengthens. At the same time, the cylinder and frame are gently pushed forward on the rollers to place the ribbon on the cylinder in a long spiral. The cylinder has flanges at the ends so that when it is removed from its bearings and placed on a sheet of paper on the table, the sections of the ribbon are not injured. When in this position each turn of the spiral may be cut and one turn after another, each approximately 8 inches long, may be spread out in order on the paper. The cylinder is $4\frac{1}{2}$ inches long, $2\frac{5}{8}$ inches in diameter, and mounted so as to bring it as close as possible to the microtome knife 10.00

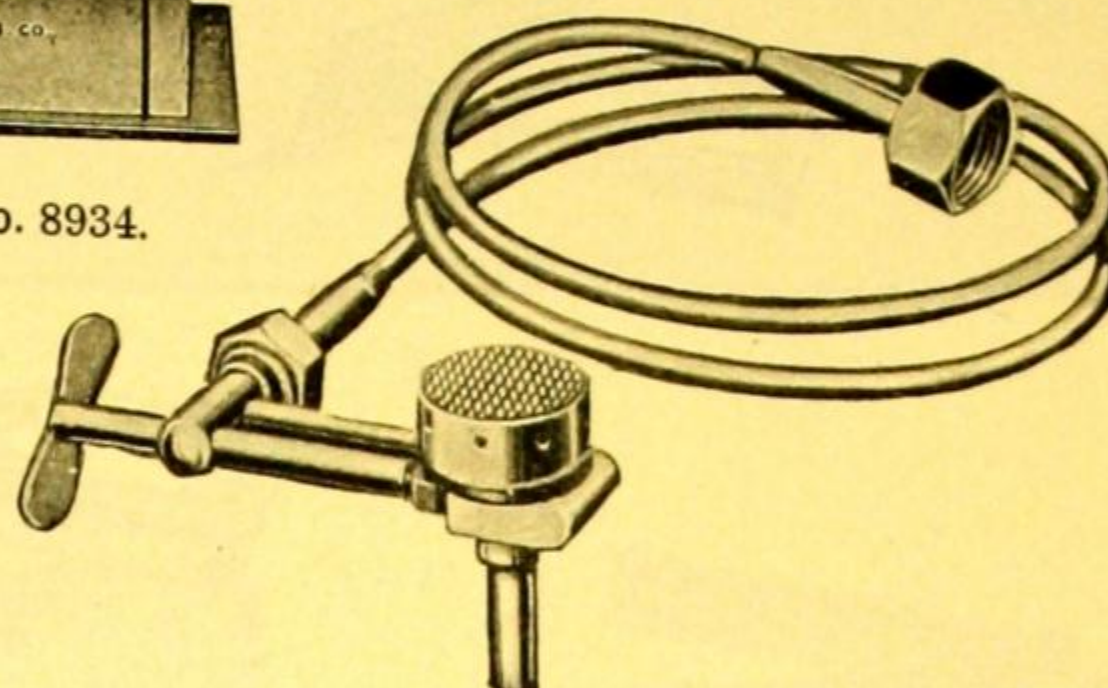
Prices on Nos. 8922, 8923 and 8925 subject to 10 per cent. discount to hospitals and educational institutions.



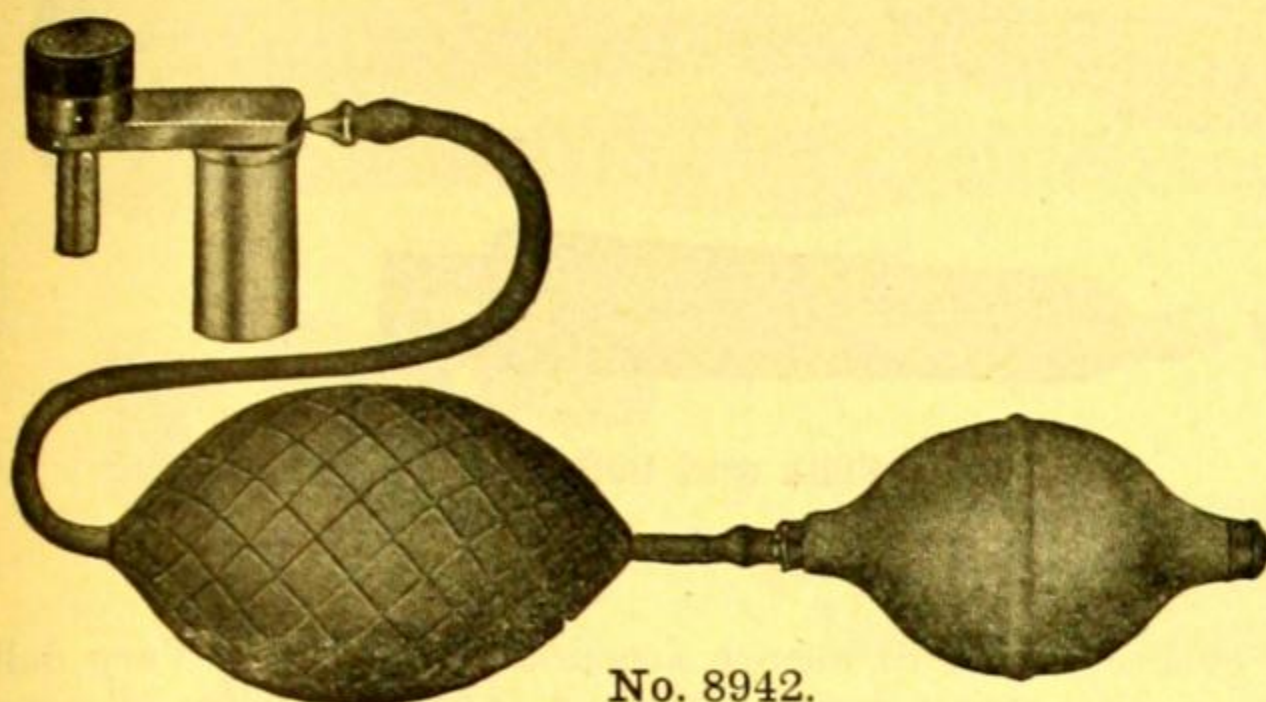
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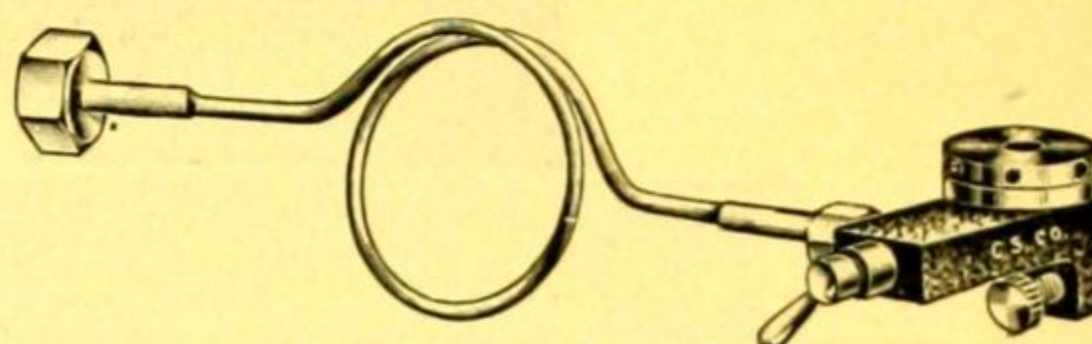
No. 8934.



No. 8940.



No. 8942.



No. 8941.

MICROTOME ACCESSORIES

- 8932.
- BLOCKS, Red Fiber**
- , for holding specimens for sectioning.

No.	A	B	C	D
Size, inches	$\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$	$\frac{5}{8} \times \frac{5}{8} \times \frac{3}{4}$	$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4}$	$1 \times 1 \times \frac{3}{4}$
Per 100	\$3.50	4.00	5.00	7.50

- 8934.
- EMBEDDING BOX for Paraffine**
- , consisting of two angle pieces of metal with a metal plate.

No.	A	B	C
Height, mm	10	20	30
Each	1.20	1.25	1.30

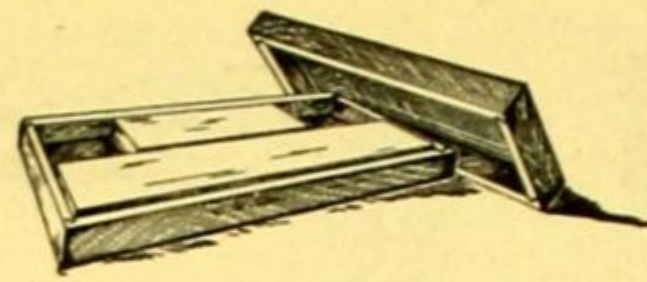
- 8936.
- EMBEDDING TABLE for Paraffine**
- , of copper, 400 mm long and 190 mm wide tapering to a point. With removable legs, 213 mm high..... 3.75
-
- For other
- Embedding Tables**
- , see Nos. 8862 and 8864.

- 8940.
- FREEZING ATTACHMENT for Carbon Dioxide**
- , for Nos. 8884, 8910 and 8915 Microtomes. Substantially made, easy to operate, and exceedingly efficient. A hard rubber non-conducting ring between the corrugated plate, to which the object is frozen, and the rest of the apparatus, prevents the conduction of cold away from the specimen, thus saving time and gas. The chamber is provided with a pin like that on the object clamp, which fits into the same socket on the microtome. The chamber is connected with the CO
- ₂
- cylinder by a flexible copper tube. In operating, the valve at the chamber should first be closed and the valve at the cylinder slightly opened, to admit the gas into the tube. Then, by opening and closing the small valve at the chamber three or four times in quick succession, the tissue is frozen without any waste of gas and without any inconvenience caused by the freezing up of the chamber or the connections. By this method a section may be cut, stained and mounted ready for examination in one and one-half minutes from the time the tissue is put on the chamber. Complete with copper tube connections..... 13.50

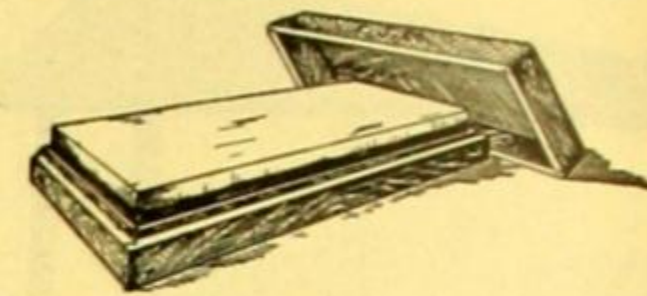
- 8941.
- FREEZING ATTACHMENT for Carbon Dioxide**
- , for Nos. 8888 and 8893 microtomes. Same as No. 8940, but with clamp for attachment to the vertical side of the microtome. Complete with copper tube connections..... 13.50

- 8942.
- FREEZING ATTACHMENT for Ether**
- . Consists of a freezing chamber of hard rubber which so prevents the radiation of the cold that the tissue is quickly frozen. It will freeze tissue 15 mm in diameter and 3 mm thick in one minute, using only 5 cc of ether. The ether is held in the metal tank, which for filling may be unscrewed from the support from which it is suspended. Any excess of ether which does not evaporate is drained back into the metal chamber from which it came. There are no bottles or entangling tubes and no waste of ether. It is simple, compact and efficient. It can be used on Nos. 8884, 8910 and 8915..... 9.00

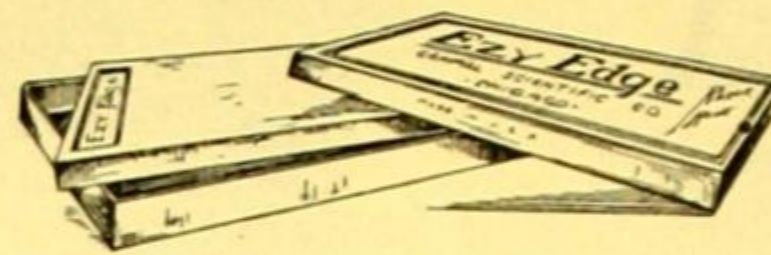
Prices on Nos. 8940, 8941 and 8942 subject to 10 per cent. discount
to hospitals and educational institutions.



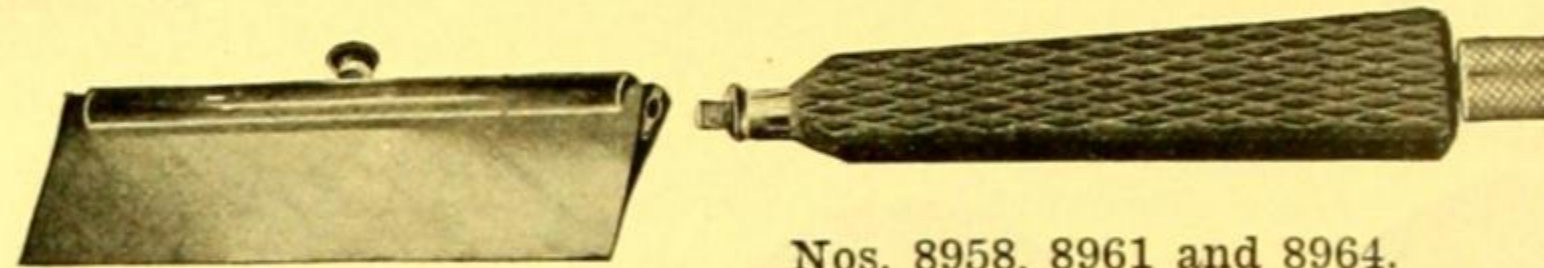
No. 8947.



No. 8950.



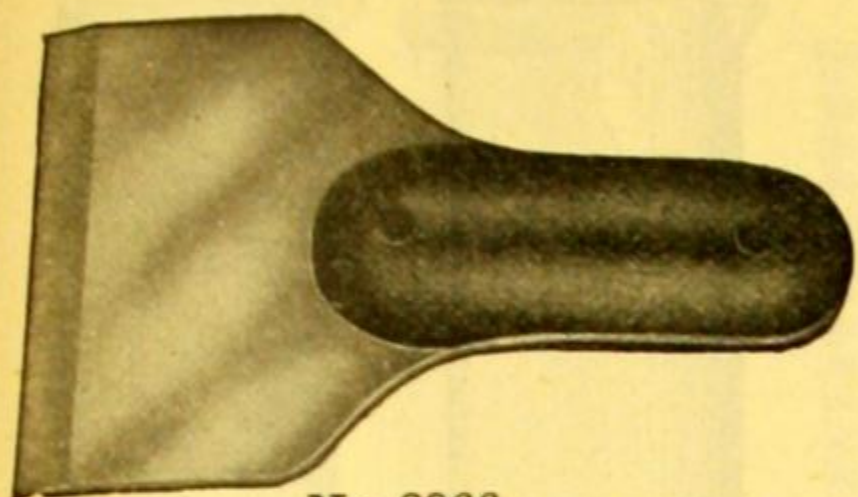
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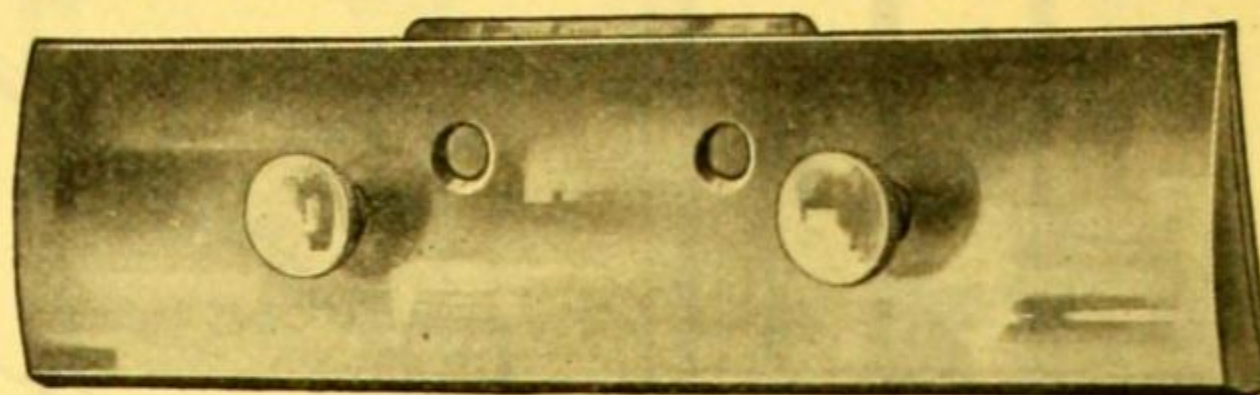
Nos. 8958, 8961 and 8964.

8946. **HONE, Yellow Belgian**, selected with the greatest care to assure freedom from grit. Very dull microtome knives should first be honed on this stone dressed with a lather of palm oil soap until a very fine wire edge appears. A second honing should then be given the knife on a blue-green water hone which has a finer grain than the yellow Belgian hone. Length, 6 inches \$2.00
8947. **HONE, Yellow Belgian**, same as No. 8946 but larger and mounted in a wooden box with cover. Length 10 inches..... 9.00
8948. **HONE, Ezy Edge**, an artificial hone made of the finest grade of natural materials, manufactured by a special process, which secures absolute evenness of grit and texture throughout, producing a fast, smooth cutting hone combining the sharpness of the artificial hone with the softness of the Belgian. An edge quite satisfactory for free hand sectioning can be obtained in a single honing with this stone. Length 5¼ inches. With directions for use..... .60
8950. **HONE, Blue-Green**, a finishing hone of finer texture than the Belgian, imparting a long lasting edge. Its slow cutting properties tend to prevent over honing. A small rubbing block accompanying each hone is used to prepare the surface by rubbing with water. Length, 6 in. .50
8952. **Palm Oil Soap**, for preparing a lather to dress Nos. 8946-8948 Hones.....per cake .15
8958. **KNIVES, Microtome**, of selected steel, so ground and tempered as to produce an edge which is not brittle and at the same time is hard enough and tough enough to retain its keenness. Comparatively easy to sharpen; evenly tempered; broad and heavy. Without handle or back, in velvet case.
- | | | | | |
|------------------|------|------|------|-------|
| No. | AA | B | BB | C |
| Length, mm | 90 | 110 | 125 | 185 |
| Each | 8.00 | 8.00 | 9.00 | 14.50 |
8960. **KNIVES, Microtome**, similar to No. 8958, but designed specially for use with Microtome No. 8922. Length of cutting edge, 110 mm. Without handle or back; in velvet lined case.
- | | | |
|--------------------|-----------|-----------|
| No. | A | B |
| For sections | celloidin | paraffine |
| Each | 9.50 | 9.50 |
8961. **Handle, Ebonized**, for use in sharpening Nos. 8958 and 8960 Microtome Knives. The handle is provided with steady-pins to hold it in proper position, while the handle-rod is threaded to engage directly with the corresponding thread cut in the knife, and is tightened by means of a milled head. The metal parts are finely nickel-plated 2.25
8964. **Honing Backs**, consisting of a slotted metal tube provided with a screw clamp for attaching to the back of Nos. 8958 and 8960 microtome knives as indicated, in order that the knife may rest upon the hone or strop at the proper angle when being sharpened.
- | | | | |
|-------------------|-------------|-------|----------|
| No. | A | B | C |
| For knife No..... | 8958AA & BB | 8958B | 8960A, B |
| Each | 1.75 | 1.75 | 1.75 |

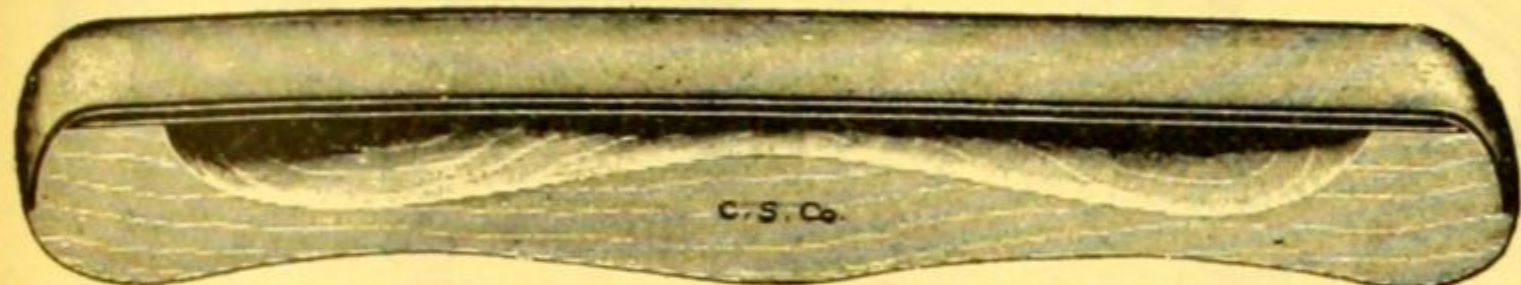
Prices on Nos. 8958, 8960, 8961 and 8964 subject to 10 per cent. discount to hospitals and educational institutions.



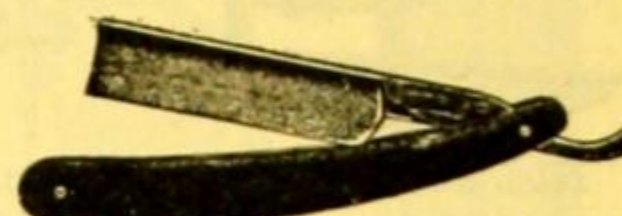
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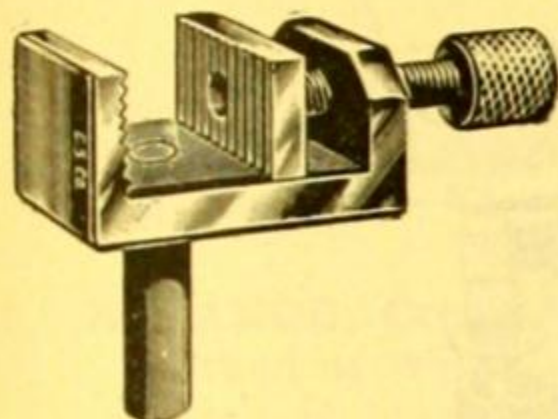
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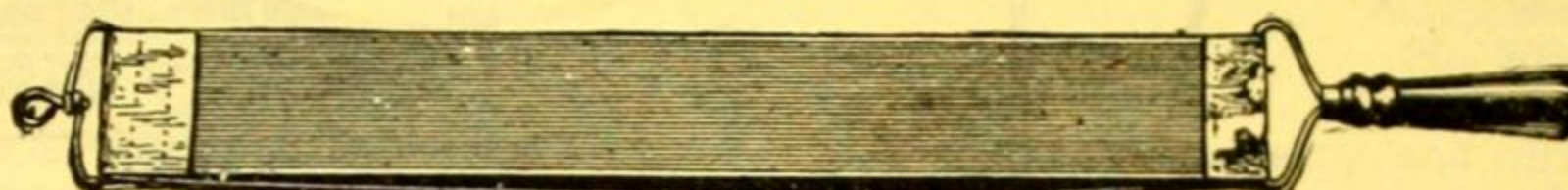
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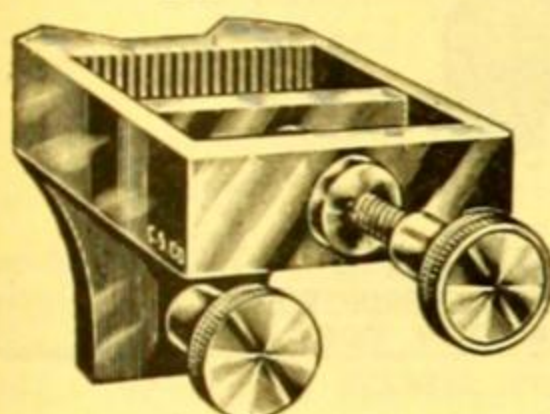
No. 8978.



No. 8970.



No. 8992.



No. 8971.

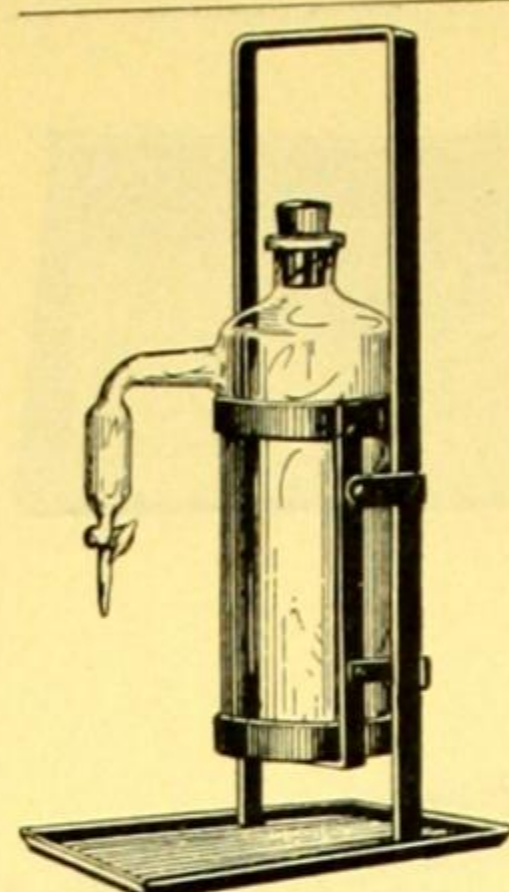


No. 8994B.

8966. **KNIFE, Microtome, Chisel Blade**, designed for use on Nos. 8884 and 8886 microtome, especially where a freezing chamber is used. Cutting edge, 88 mm. The handle is of such size and shape that the knife may be easily held in the desired position..... \$5.00
8968. **KNIFE HOLDER for Safety Razor Blades**, of brass, nickel-plated, for use on any microtome which has a knife clamp. The thin edge of the blade projects beyond the upper edge of the holder just enough to keep it as rigid as possible, and at the same time far enough to allow the specimen to pass by the holder after cutting the section..... 6.50
8970. **OBJECT CLAMP**, for use on microtomes Nos. 8886 and 8912 in place of the freezing attachment when it is desired to cut paraffine or celloidin sections. Will take objects up to 30 by 22 mm 3.00
8971. **OBJECT CLAMP**, similar to No. 8970 but arranged for attaching to microtomes Nos. 8889 and 8895 in place of the freezing attachment..... 7.00
8972. **PITH**, for use in cutting sections; in sticks about 100 mm in length and 6 to 12 mm in diameter; in packages of about 50 grams..... per package .10
8978. **RAZOR, Section**, folding handle, best quality; one side of blade flat, the other side concave; straight edge, hard rubber handle; length of blade, 80 mm. In case..... 2.00
8985. **STROP, Microtome Knife**, consisting of a Russian leather strop measuring 365 by 50 mm, mounted on a polished wooden block of special shape to allow the knife to come into intimate contact with the leather strop under slight pressure 3.50
8992. **STROP, Razor**, 21x2 inches, of double Russian red leather. with India filled back, corrugated, with nickel-plated swivel and handle..... 1.10
- 8994B. **STROP, Razor, Emerson**, consisting of a wood strip with handle, covered on both sides with especially prepared calf skin. The stropping should be begun on the brown side and finished on the dark side. Length, 17½ inches..... 2.90
8996. **DRESSING** for strops..... per box .35

Prices on Nos. 8966 to 8971 subject to 10 per cent. discount to hospitals and educational institutions.

Our **Biological Stains**, prepared for us by the Coleman-Bell Company, are the result of intensive effort and careful research to produce dyestuffs of great purity for biological use. They are certified by the most rigid chemical and biological tests, insuring to the user the satisfaction and confidence that comes from working with a highly purified product.

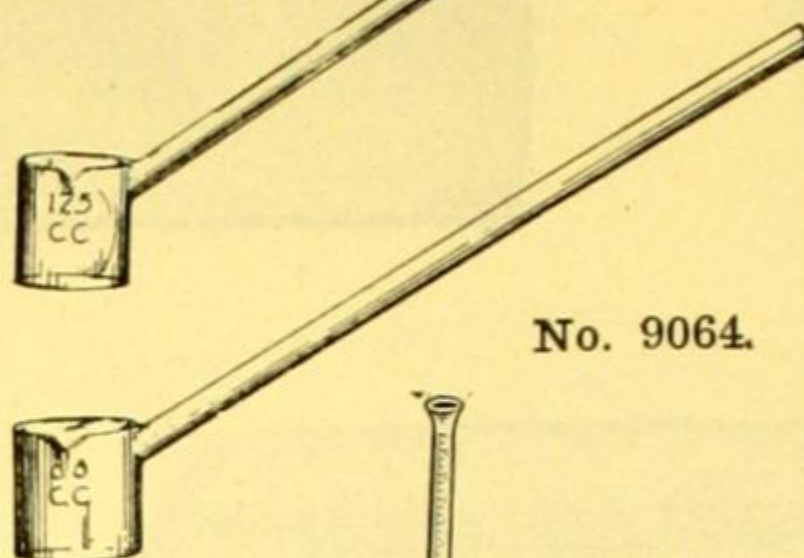


Nos. 9050 and 9052.

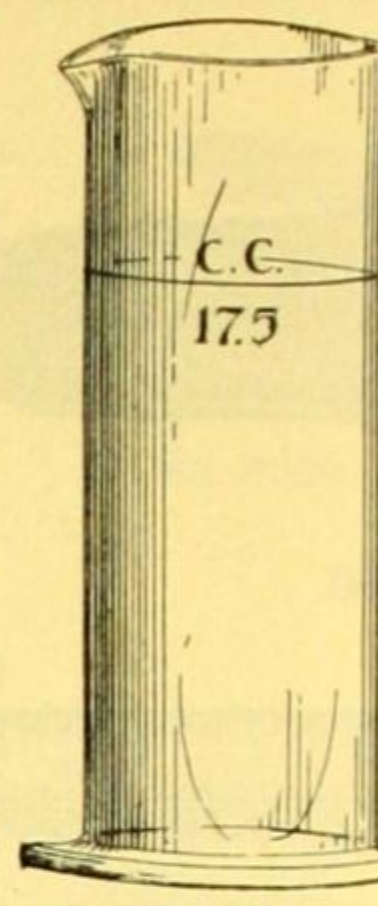


No. 9056.

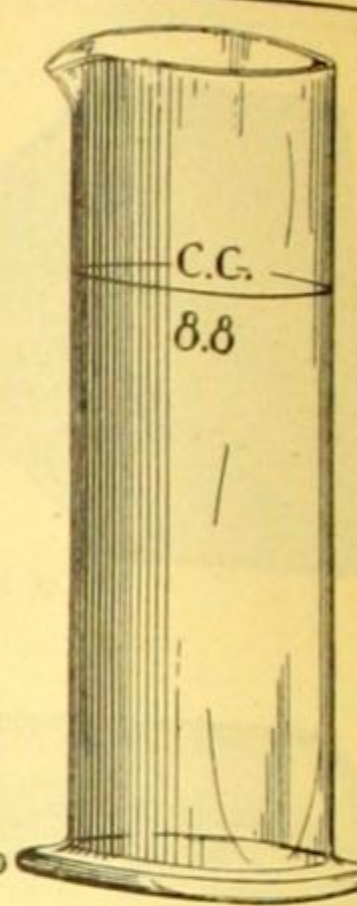
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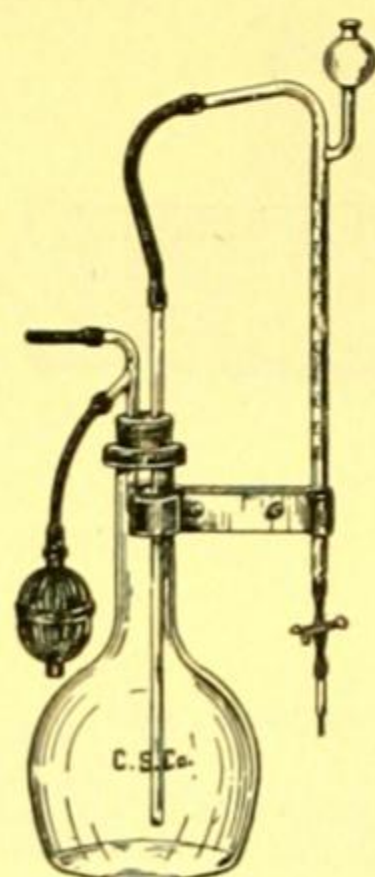
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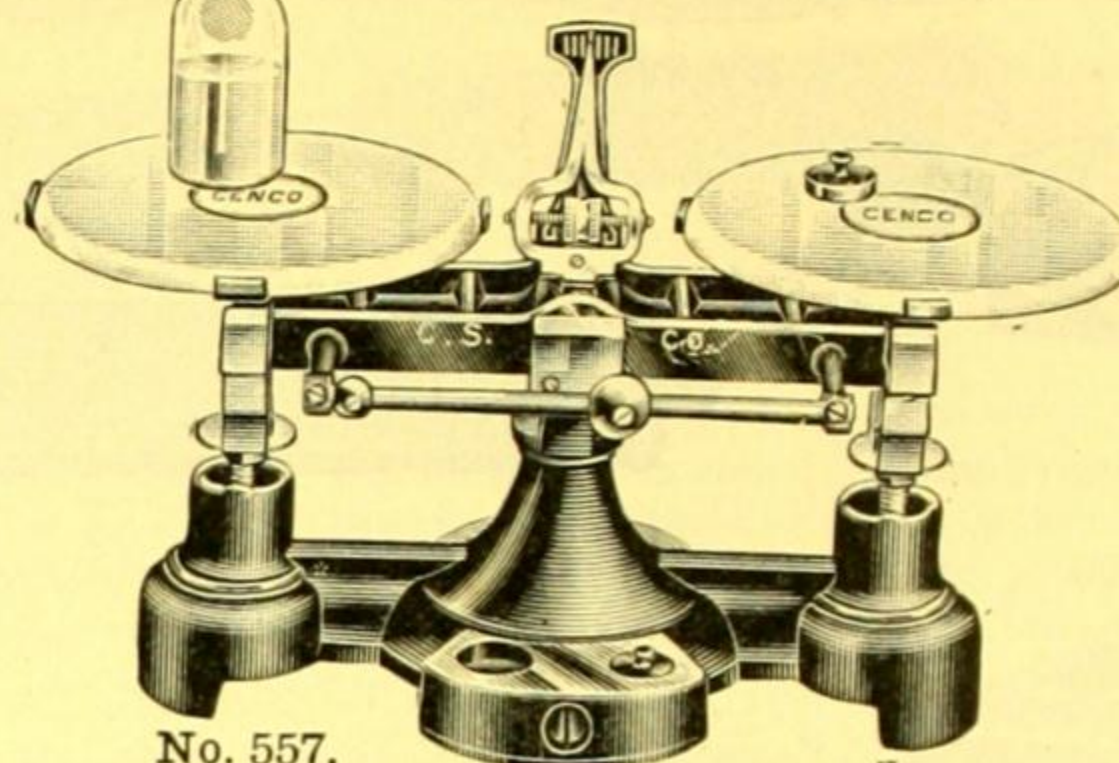
No. 9066.



No. 9068.



No. 9079.



No. 557.

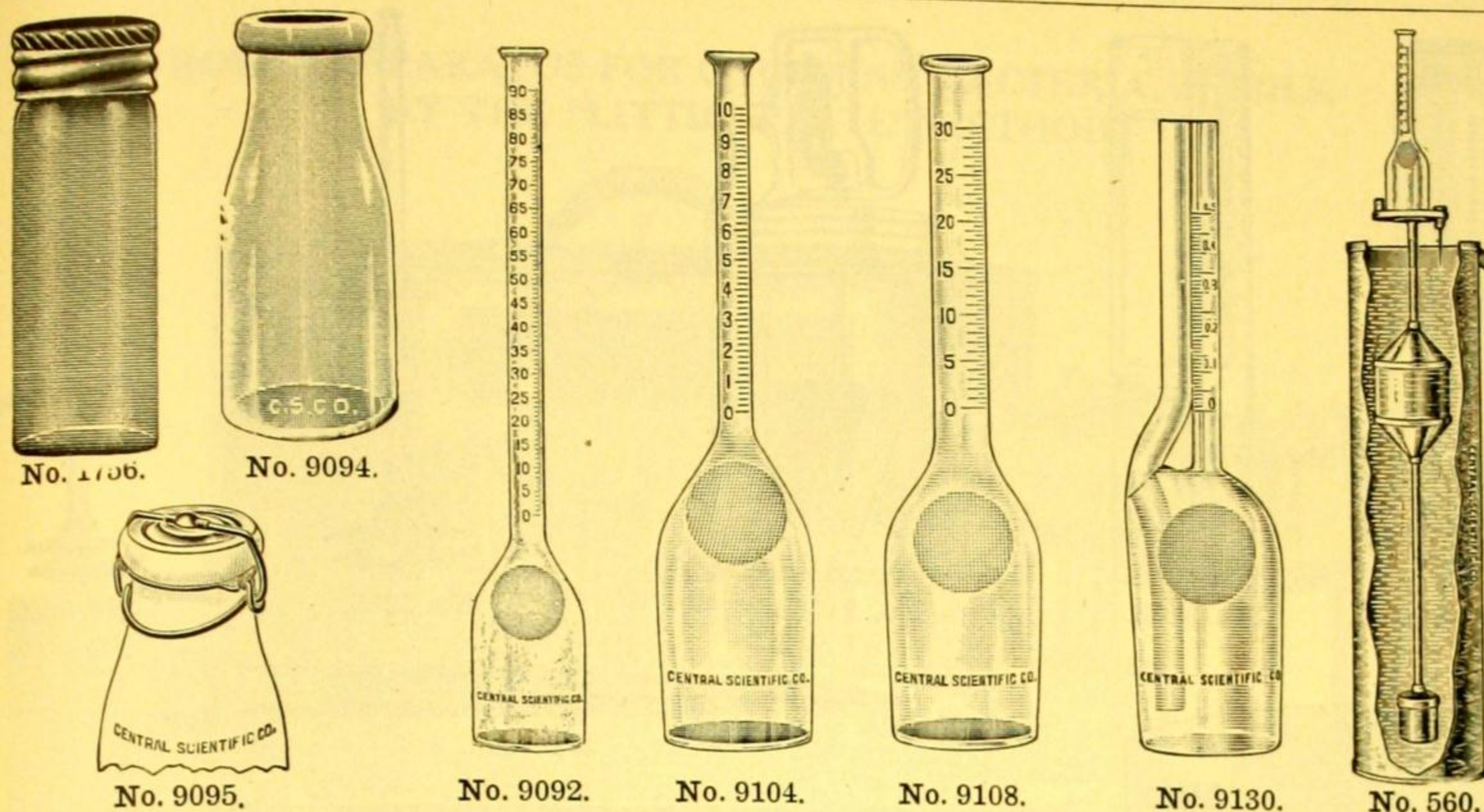


No. 9080.

MILK AND BUTTER TESTING APPARATUS

(Arranged Alphabetically.)

9050. **ACID BOTTLE, Combined.** By tipping the bottle forward and then letting it come back to upright position, the pipette will fill with 17.5 cc of acid..... \$5.50
9052. **ACID BOTTLE TRUNNION,** convenient for handling No. 9050 Acid Bottle. Base is of wood covered with lead, which is not acted on by sulphuric acid. Bottle automatically returns to position after tipping 2.60
9056. **ACID BURETTES.** No..... A B C
 Number of charges of 17.5 cc..... 3 6 12
 Each 2.00 2.00 2.50
9062. **ACID DIPPER, Nafis' Style,** 17.5 cc..... .40
9064. **ACID DIPPER, Nafis' Style,** 8.8 cc..... .40
9066. **ACID MEASURE, cylindrical jar with lip,** 17.5 cc12
9068. **ACID MEASURE, cylindrical jar with lip,** 8.8 cc15
9079. **ACID TESTER,** automatic, easy to manipulate and self-adjusting, with volumetric reservoir flask which permits the proper dilution of the concentrated neutralizer without the use of a measuring graduate. The liquid in the burette instantly readjusts itself to zero, so that the only reading to be taken in using the apparatus is at the point on the graduated burette where the liquid surface is located after the sample is neutralized. Complete with neutralizer, indicator, 9 cc pipette, stirring rod, beaker and full directions..... 6.75
9080. **Stirring Rod, Nafis',** for use in acidity tests. Consists of a hollow glass rod containing two shades of pink selected as the maximum and minimum shades which the sample of milk should have when the acidity test is complete..... .30
- ACIDOMETER,** see general heading **Hydrometers.**
- APRONS,** see general heading **Aprons.**
557. **BALANCE, Cream and Milk Testing,** for weighing samples for the Babcock test. This balance is of the same construction as our well known Cenco Agate Bearing Trip Scale, with rigid one-piece beam of aluminum alloy, 6 inch round porcelain plates, hardened steel knives and agate bearings. In place of the usual graduated beam, a round bar is provided carrying a large and small counterpoise for use in balancing the empty test bottle. The counterpoises may be locked in place by means of set screws. A polished wooden block is attached to the front of the base containing 9 and 18 gram brass weights. The balance is nicely made and well finished. Capacity, one bottle; sensibility, 100 milligrams..... 15.00



560. **BALANCE, Cream, Wisconsin Hydrostatic**, devised to meet the demand for a simple and correct method of weighing cream into test bottles. It consists of a specially devised brass float, which is placed in a cylinder of water. The instrument is weighted so as to float in a vertical position, and has at the top a small pan on which a cream bottle and a 9-gram weight are placed. By means of an adjustable pin point, the point to which the float sinks in water is readily marked. The 9-gram weight is then taken from the pan and the cream to be tested is weighed by dropping it slowly into the bottle with a pipette until the float sinks to the same point it reached with the weight on the pan, when the test bottle will contain exactly 9 grams of cream. Very accurate weighings can be made with this instrument and as there are no bearings to rust it will retain its sensitiveness indefinitely. Complete with metal cylinder, float, and 9-gram weight, but without bottle \$7.50
561. **Weights, Extra**, for Nos. 557 and 560. No. A B
Size, grams 9 18
Each30 .95
- For other **BALANCES** for milk and cream testing, see general heading **Balances**.
1756. **BOTTLES, Aluminum Screw Cap**, for holding samples of cream. With cork-lined cap. One ounce capacity per dozen 1.00
9092. **BOTTLE, Butter Test, Illinois pattern**, a 9 inch bottle for testing 9 gram samples of butter. The neck is graduated for reading up to 90 per cent., and the results obtained compare very favorably with those obtained by chemical analysis55
per dozen 5.00
9094. **BOTTLES, Milk Jars**, for composite tests, made of flint glass; will stand much hard usage.
Capacity, pints 1/2 1 2
Per dozen 1.00 1.30 1.60
9095. **CAPS, Tin**, for No. 9094 Milk Jars. Will fit either size, and keep out dirt and impurities.
Per dozen45

BOTTLES, MILK AND CREAM TEST, USUAL TYPE

		Each	Per doz.
9102.	BOTTLE, Milk Test , 6 inch, 18 gram, 8%. Graduated to 1/10%.....	.30	2.90
9104.	BOTTLE, Milk Test , 6 inch, 18 gram, 10%. Graduated to 2/10%.....	.30	2.70
9108.	BOTTLE, Cream Test , 6 inch, 18 gram, 30%. Graduated to 1/2%.....	.35	3.05
9110.	BOTTLE, Cream Test , 6 inch, 18 gram, 40%. Graduated to 1%.....	.35	3.05
9112.	BOTTLE, Cream Test , 6 inch, 18 gram, 50%. Graduated to 1%.....	.40	3.55
9114.	BOTTLE, Cream Test , 6 inch, 9 gram, 50%. Graduated to 1/2%.....	.40	3.55
9120.	BOTTLE, Cream Test , 9 inch, 18 gram, 30%. Graduated to 2/10%.....	.45	4.20
9122.	BOTTLE, Cream Test , 9 inch, 18 gram, 50%. Graduated to 1/2%.....	.45	4.20
Note:—Nine inch Cream Test Bottles are too long for regular Babcock Testers. Prices on special testers for cream bottles will be quoted upon request.			
9130.	BOTTLE, Skim Milk, Perfect , 6 inch. Graduated to 1/100%.....	.85	9.00

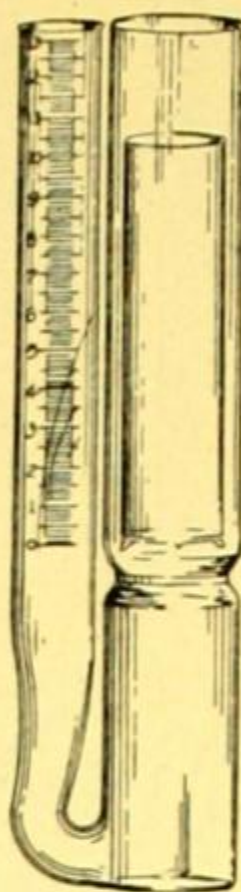
BOTTLES, MILK AND CREAM TEST, STANDARD

The following bottles (Nos. 9136 to 9142) are made in accordance with the specifications formulated by the Bureau of Standards, Washington, D. C., and adopted by the Official Dairy Inspectors' Association, and by the State of Indiana.

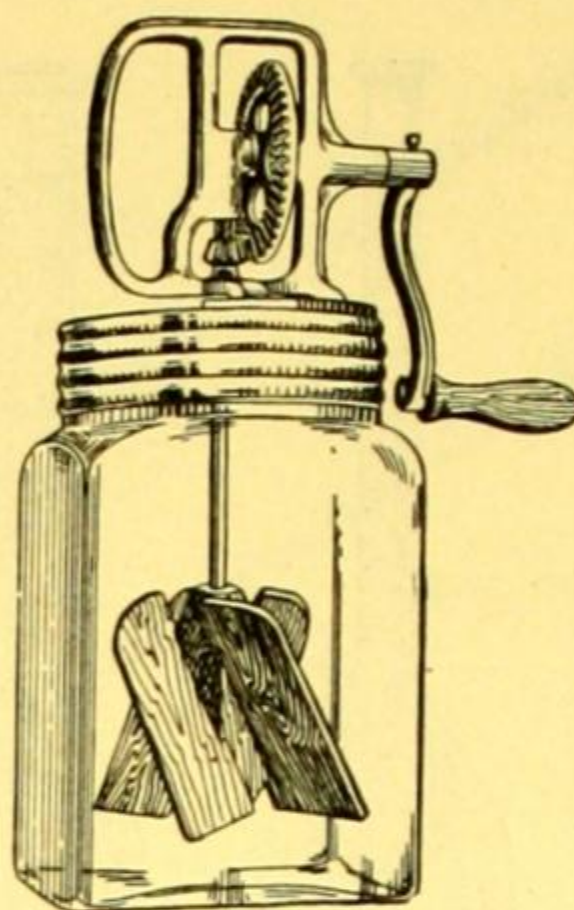
		Each	Per doz.
9136.	BOTTLE, Milk Test, Standard , 6-inch, 18-gram, 8%. Graduated to 1/10%.....	.35	3.35
9140.	BOTTLE, Cream Test, Standard , 6-inch, 9-gram, 50%. Graduated to 1/2%.....	.45	4.15
9142.	BOTTLE, Cream Test, Standard , 9-inch, 9-gram, 50%. Graduated to 1/2%.....	.45	4.15



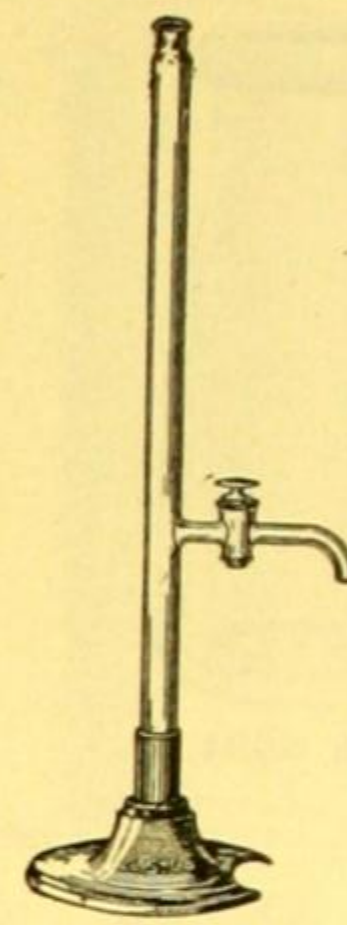
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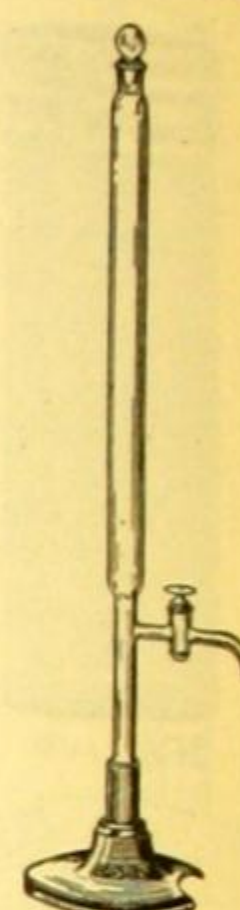
No. 9172.



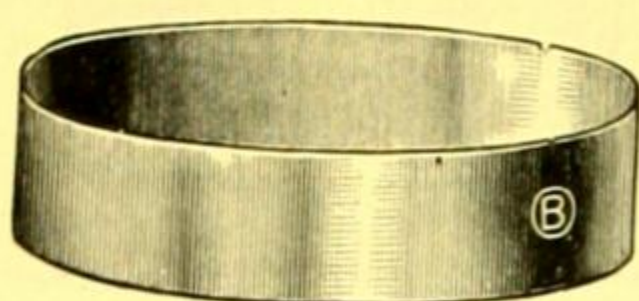
No. 9174B.



No. 5255.



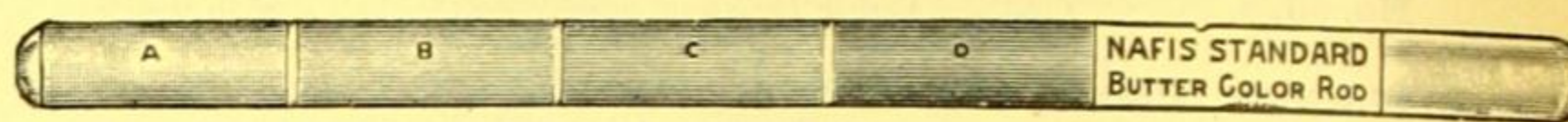
No. 5256.



No. 3850.



No. 4192.



No. 9176.

The following bottles (Nos. 9146 to 9160) are made in accordance with the specifications formulated by the Dairy and Food Commission, Madison, Wis.

9146.	BOTTLE, Milk Test, Standard, 6-inch, 18-gram, 10%. Graduated to $\frac{2}{10}\%$	.35	3.05
9150.	BOTTLE, Cream Test, Standard, 6-inch, 18 gram, 30%. Graduated to $\frac{1}{2}\%$	.40	3.45
9152.	BOTTLE, Cream Test, Standard, 6-inch, 18-gram, 40%. Graduated to $\frac{1}{2}\%$	.40	3.60
9160.	BOTTLE, Cream Test, Standard, 9-inch, 18-gram, 50%. Graduated to $\frac{2}{10}\%$	.50	4.45

BRUSHES for cleaning Milk and Cream Test Bottles, see general heading Brushes.

BRUSH for cleaning Milk Jars, see Brushes.

CAPSULES, see general heading Capsules.

9170.	CASEIN TUBE, Hart's, for estimating amount of casein in milk. To be used in any Babcock Milk Tester	each	\$0.40
		per dozen	4.20

9172.	CATALASE APPARATUS, for determining the presence and relative amount of catalase in milk, with measuring arm graduated from 0 to 13 cc in $\frac{1}{10}$ cc divisions. Complete with tube for holding sample, one-hole rubber stopper and glass rod to close hole in stopper.....	2.50
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9173.	CHARTS, Milk Record, for one week's record of 15 cows, with spaces for both morning and afternoon production, in pounds and tenths	per hundred	1.00
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9174B.	CHURN, Dazey, for family and experimental use. Jars are of glass, so that process can be watched, and are made square to prevent racing of cream and to give double agitation. With aluminum-coated castings, heavily nicked cap, hardwood turbine dasher, heavily tin-plated dash rod, smooth-running gears, with directions for use. Total capacity, $7\frac{1}{2}$ pints. Churning capacity, $3\frac{3}{4}$ pints.....	2.50
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9176.	COLOR ROD, for butter color test, consisting of a glass tube, pencil size, containing four standard shades of yellow based upon the color formulae of the U. S. Bureau of Standards. Convenient for securing uniformity of color in various plants for certain markets, also as a definite color standard.....	each	.50
		per dozen	4.80

3850.	DISHES, Milk, of aluminum, flat bottom, straight sides.				
	No.	A	B	C	D
	Diameter, inches	2	2½	3	4
	Height, inches	½	⅝	¾	1
	Each	.15	.20	.25	.30

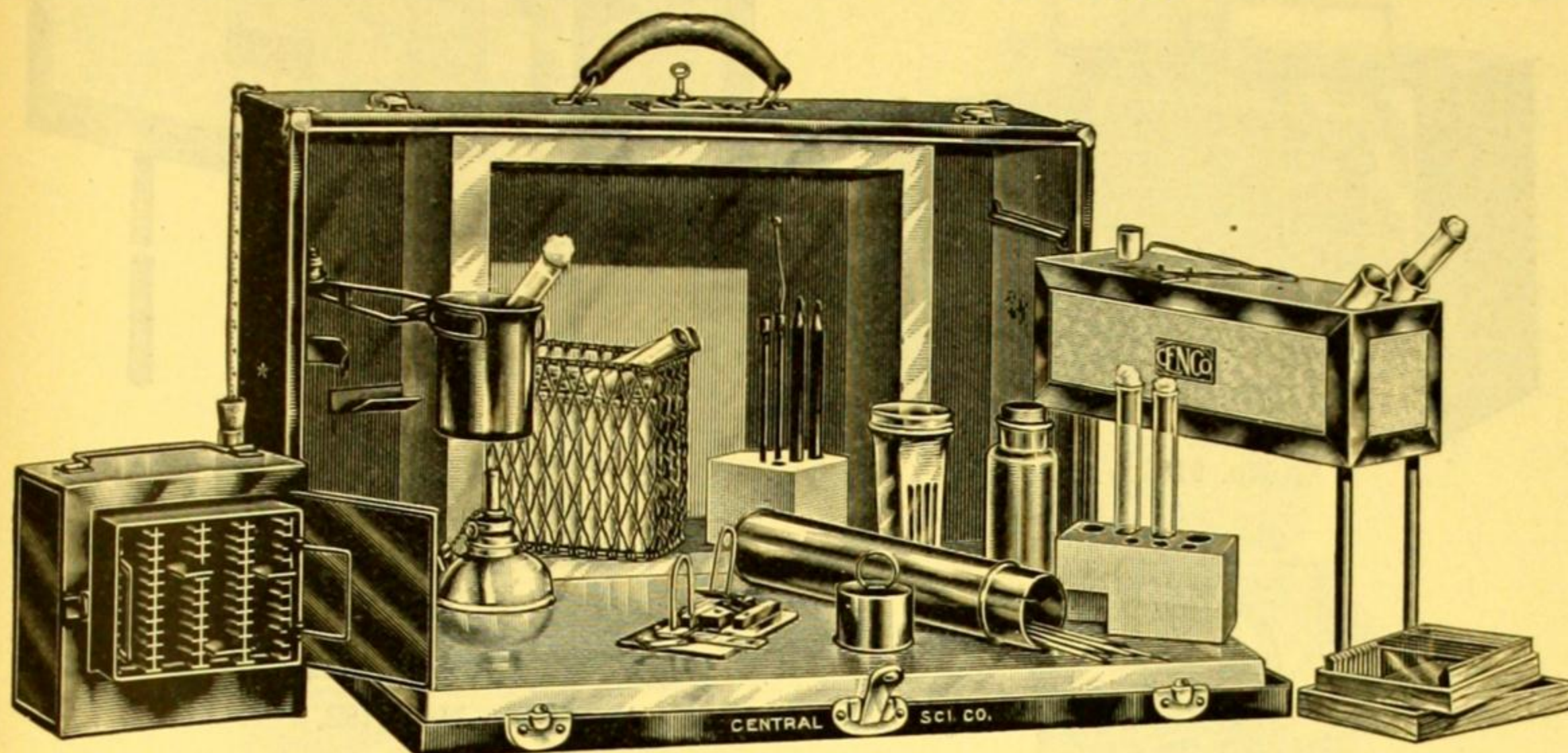
10% discount in lots of 12.

4192.	DIVIDERS, Plain Brass, for reading graduations on test bottles. Length $4\frac{1}{2}$ inches....	.45
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10% discount in lots of 12.

5255.	EXTRACTION APPARATUS, Röhrig, for the determination of fat in milk and dairy products, by the Roesse-Gottlieb Method, adopted by the Association of Official Agricultural Chemists. With side-tube and stop-cock for withdrawing solvent. Unstoppered and ungraduated. (See Association of Official Agricultural Chemists "Methods of Analysis," 1920 edition, page 227.)	
5256.	EXTRACTION APPARATUS, Biesterfeld modification of the Röhrig Tube, for the estimation of fat in condensed milk and milk powders by modified Roesse-Gottlieb method. (See Journal of Industrial and Engineering Chemistry, Vol. IX, December 1917, page 1111.)	

FROST'S APPARATUS FOR COUNTING BACTERIA IN MILK BY THE "LITTLE PLATE" METHOD



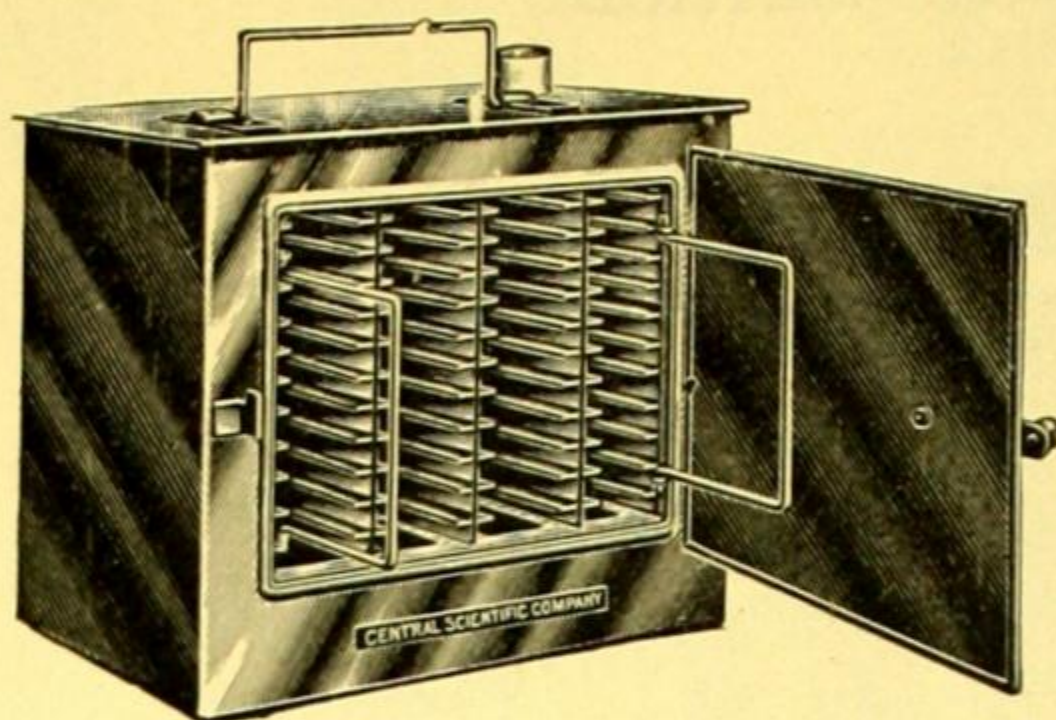
No. 9178.

A rapid method for counting living bacteria in milk has been devised by Prof. W. D. Frost, of the Bacteriology Laboratories of the Department of Agriculture, University of Wisconsin, combining the old Koch plate and the microscopic count methods, but having many decided advantages; it is more rapid, requiring one-eighth to one-third of the time required for the plate method; it is more reliable in that there is a lack of interference from spreaders; it is more accurate on account of the relatively larger amount of milk used; it is more comprehensive in that it permits the examination of young colonies of bacteria and to this extent offers a means of identifying particular organisms; it offers the possibility of distinguishing dead from living bacteria, making it useful in the study of pasteurization; it furnishes a means of keeping a permanent record for future use by filing the dry slides; it offers a method of determining total number of bacteria by making single cells visible through proper staining; it is economical, due to the small amount of materials used, and simple enough so that the technique may be mastered in a short time. (For description of method see Journal of Infectious Diseases, Vol. XXVIII, No. 2, February 1921, pages 176-184, "Improved Technique for the Micro or Little Plate Method of Counting Bacteria in Milk," by Dr. W. D. Frost; and Standard Methods for the Bacteriological Examination of Milk of the American Public Health Association, Third Edition, page 18, "Microscopic Colony Count (Frost Method).")

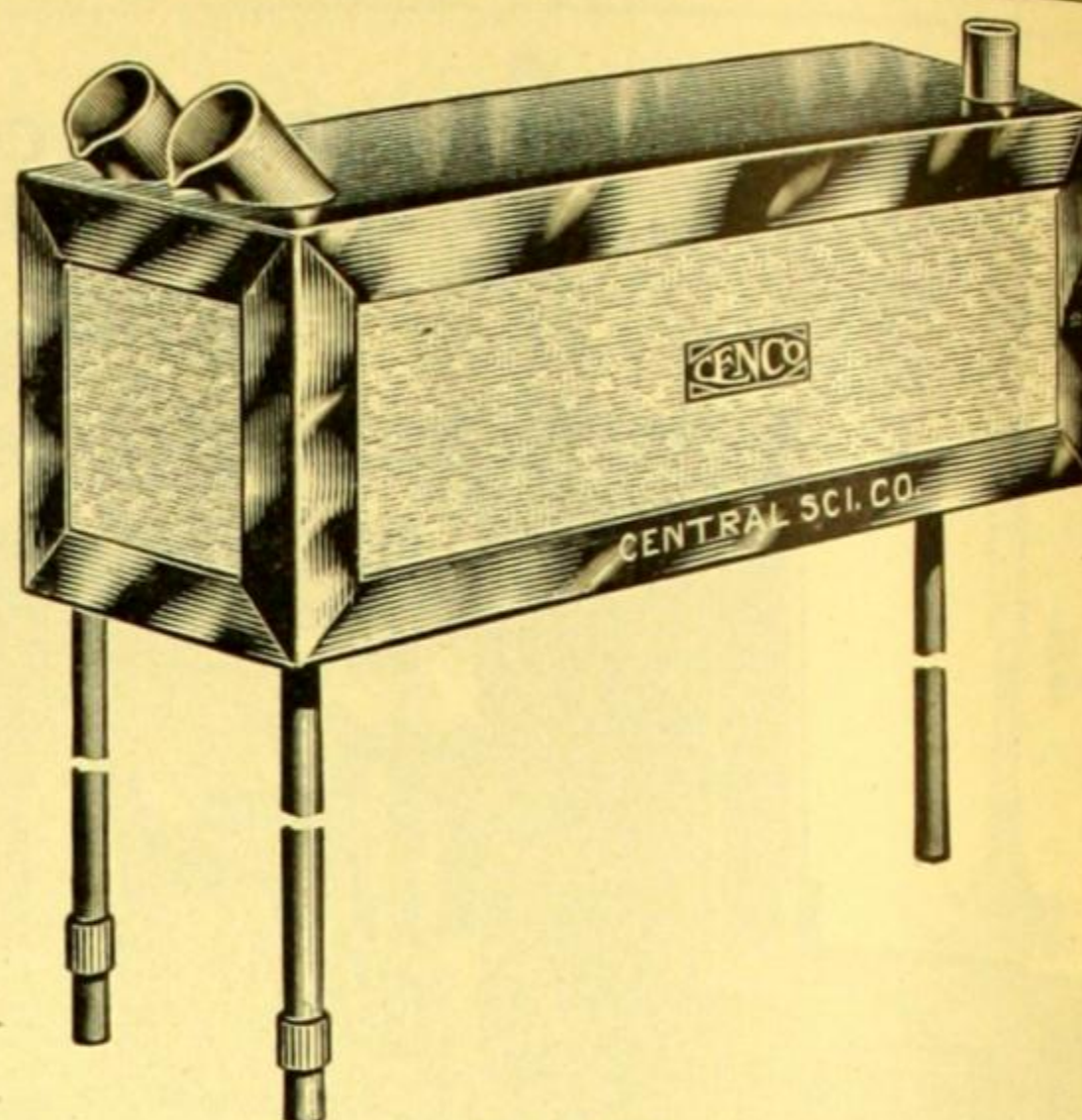
THE COMPLETE FIELD OUTFIT, packed in a substantial metal covered wooden carrying case, lined with heavily tinned sheet metal, with three inner compartments, the center one of which is double walled and insulated, consists of a double walled copper **moist chamber cabinet** for incubating the bacteria; a **warm table** to provide a means of preventing the hardening of the agar on the "little plates"; a **marking guide** to mark off definite areas on glass slides; **special forceps** for handling the glass slides; **48 special pipettes**, capacity 1/10 cc, graduated in 1/100 cc; a copper **pipette box** for use in sterilizing pipettes; copper **beaker** for heating water and agar; alcohol **lamp** for heating water and for sterilizing purposes; **Chaddock clamp** which may be supported rigidly on the carrying case for holding the copper beaker above the alcohol lamp; **72 microscope slides**; wooden **slide box**; **Coplin staining jar**; **72 bacteriological test tubes**, 4 by 1/2 inches; **4 bacteriological test tubes** for media, 6 by 3/4 inches; **basket** for holding test tubes; **2 platinum inoculating needles**; **one each red and yellow grease pencils**; **2 oz. wide mouthed bottle** with rubber stopper; a **10 gram vial of Thionin Blue dry stain**, and a **thermometer** graduated from -10° to 110°C. (For more complete description of apparatus and detailed directions for use send for Bulletin No. 97.)

9178. **FIELD OUTFIT**, Frost's, complete as described, in carrying case provided with lock and key \$150.00

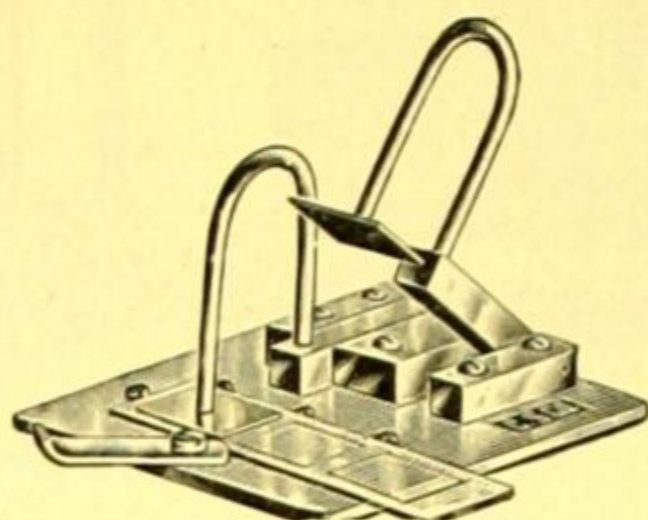
Note:—For essential parts of Frost's apparatus, see page 348.



No. 9180.



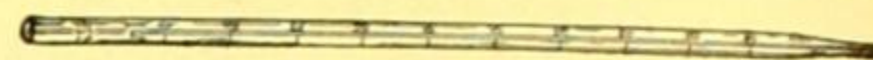
No. 9181.



No. 9183.



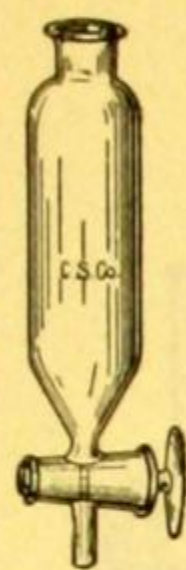
No. 9182.



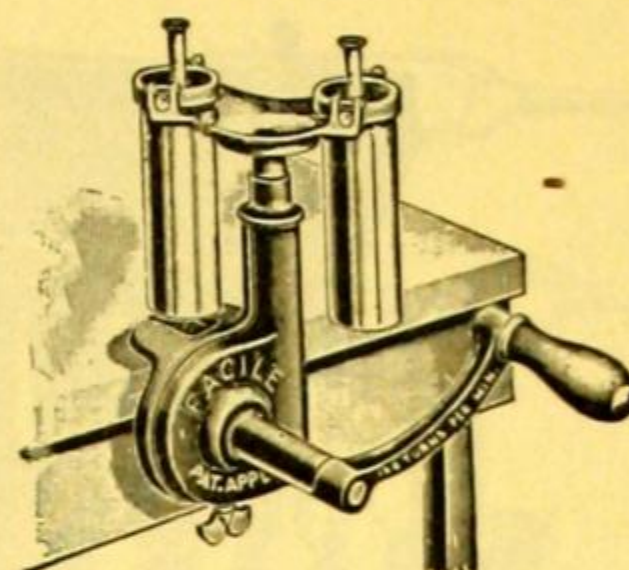
No. 9184.

ESSENTIAL PARTS OF FROST'S APPARATUS SPECIALLY DESIGNED FOR THE FROST "LITTLE PLATE" METHOD

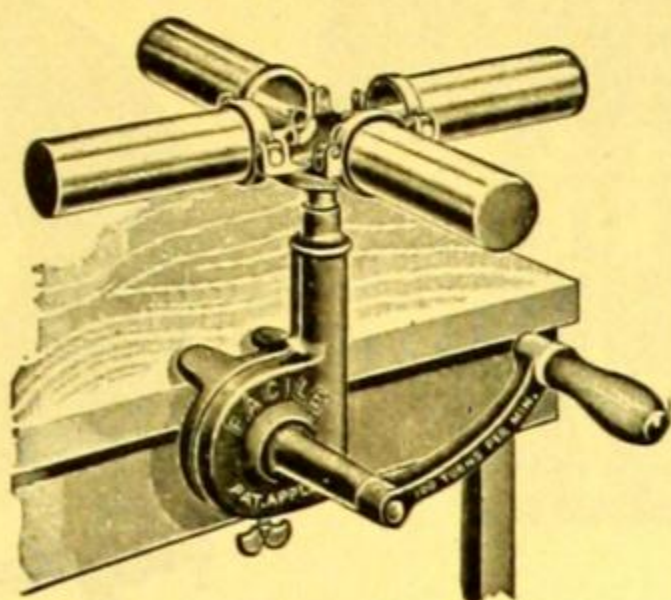
9180. **MOIST CHAMBER CABINET**, Frost's, for incubating the "little plates", constructed of sheet copper, double walled to allow circulation of moisture. Length, $6\frac{1}{2}$ inches; width, 4 inches; height, 6 inches; with chamber at bottom for holding water, provided with a removable tray which holds 48 of the microscopic slides or "little plates". When warm water is placed in the bottom chamber and the cabinet placed in an incubator or in the insulated section of the carrying case, it becomes a moist incubator in which the colonies on the "little plates" develop rapidly. With tubulature at top for thermometer and handle for carrying..... \$35.00
9181. **WARM TABLE**, Frost's, used essentially as a heating reservoir for keeping agar liquid and providing a warm table surface for keeping the "little plates" warm while receiving the charge of agar and milk; also used with hot water to provide a hot plate for drying the little plates after the incubation, preparatory to staining. Constructed of sheet copper, length, 12 inches; height without legs, 4 inches; width, 4 inches; capacity, about 2 liters; covered with transite asbestos on the sides. Two tubulatures at the top placed at an angle of 45° serve to hold tubes of liquefied agar to keep it from solidifying. Provided with three legs, two of which have knurled leveling screws to facilitate the leveling of the warm table for charging the little plates with milk and agar. With tubulature for thermometer and cross level..... 25.00
9182. **FORCEPS**, Frost's design, for handling the "little plate" slides, provided with a stop which facilitates easy handling of the slides..... 2.00
9183. **GUIDE**, Frost's Marking, as designed by Dr. Frost for accurately ruling the microscopic slides into 4 square centimeter "little plate" areas by means of a grease pencil. Consists of two thin square metal plates accurately machined to an area of 4 square centimeters, to which are soldered looped supports terminating in metal blocks which operate in grooves and cause the marking plates to fall into the same position. Glass microscope slides are held in position by studs against which they are clamped by means of an eccentric clip. With this device the "little plates" may be ruled accurately and quickly, two areas to a slide, with space at one end for a descriptive label. Constructed of brass, nickel-plated 9.00
9184. **PIPETTE**, Capillary, capacity $\frac{1}{10}$ cc, graduated to $\frac{1}{100}$ cc, made especially for use with the Frost apparatus50
9185. **CARRYING CASE AND INCUBATOR** for Field Work, consisting of a metal-covered wooden case lined with heavily tinned sheet metal, and divided inside into three compartments, the center one of which is double walled, the space being filled with an insulating material. When the moist chamber cabinet and warm table are filled with warm water and placed in this insulated compartment, the effect is that of a fireless cooker in which the temperature is held constant for a long time. The two compartments at either side of the incubator compartment provide sufficient space for the entire field outfit described on the preceding page. Clips are provided for holding the bottle and the pipette box in position and a special slotted nut and screw is provided for supporting a Chaddock clamp. Provided with lock and key..... 50.00
- Note:**—For complete field outfit of Frost's apparatus, see page 347.



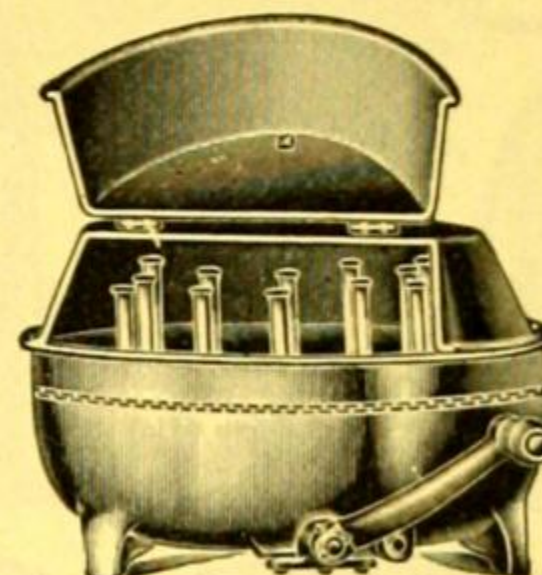
No. 9192.



No. 9194.



No. 9200.



No. 9204D.

9192. **FAT TESTING FUNNEL, Shaw, for Testing Fat in Butter**, consisting of a special separatory funnel with capillary stem, used in connection with a special cup in any ordinary Babcock testing centrifuge. In this new test for fat, the salt and part of the curd are first removed with hot water, the remaining curd is dissolved in dilute sulphuric acid, the acid solution is removed from the fat and the fat determined directly by weighing..... \$3.00

Note:—The No. 9192 Fat Testing Funnels require special cups to hold them in the Babcock testers. These cups can be made by cutting slots in ordinary Babcock cups. The funnels can be used only in 8-bottle testers or larger, Nos. 9204B, C and D, and the International Electric Babcock testers. Directions for cutting slots in Babcock cups will be sent on request.

HYDROMETERS, see general heading **Hydrometers**.

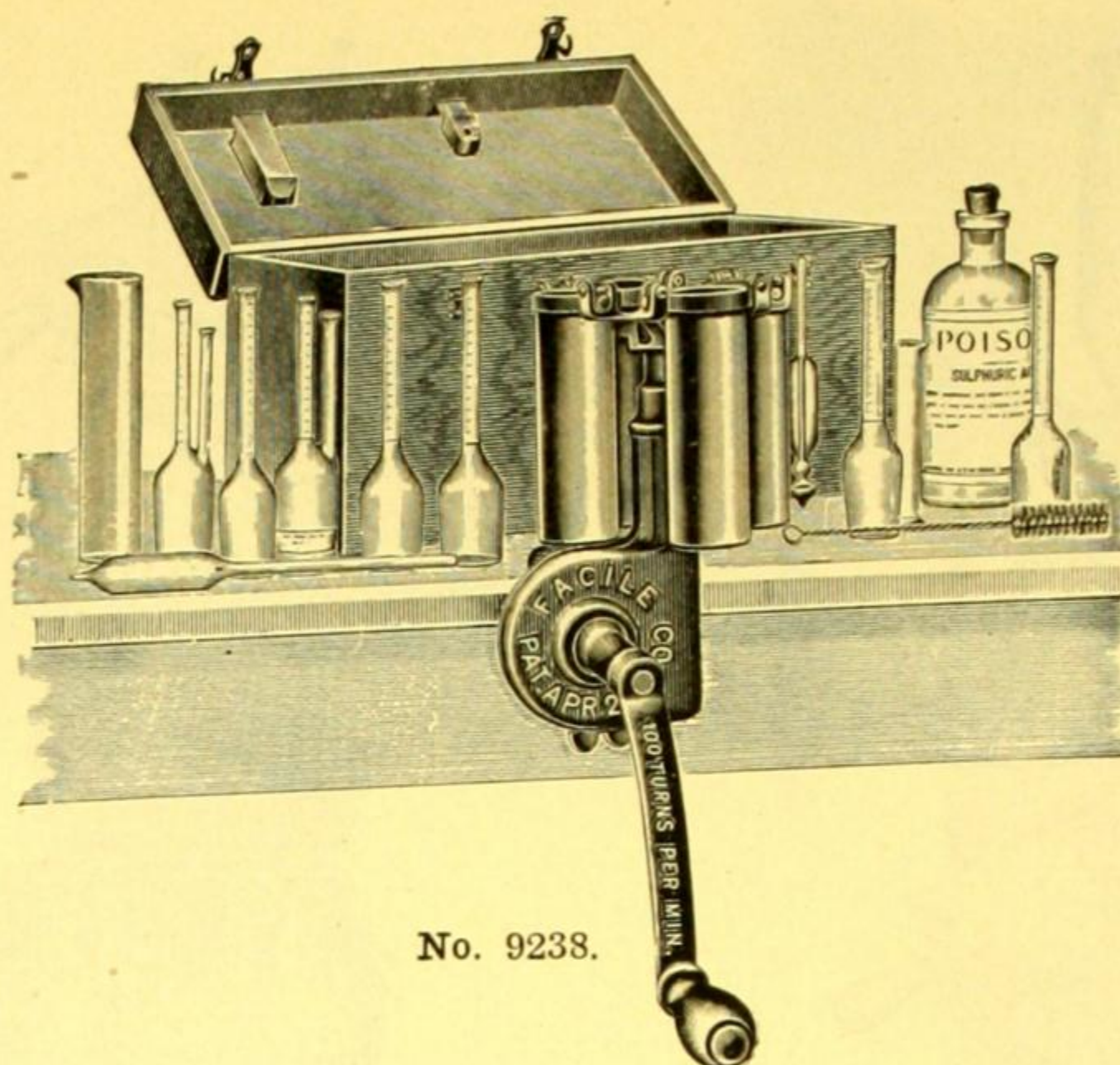
HYDROMETER JARS, see general heading **Cylinders**.

JARS, Sample, see general heading **Jars**.

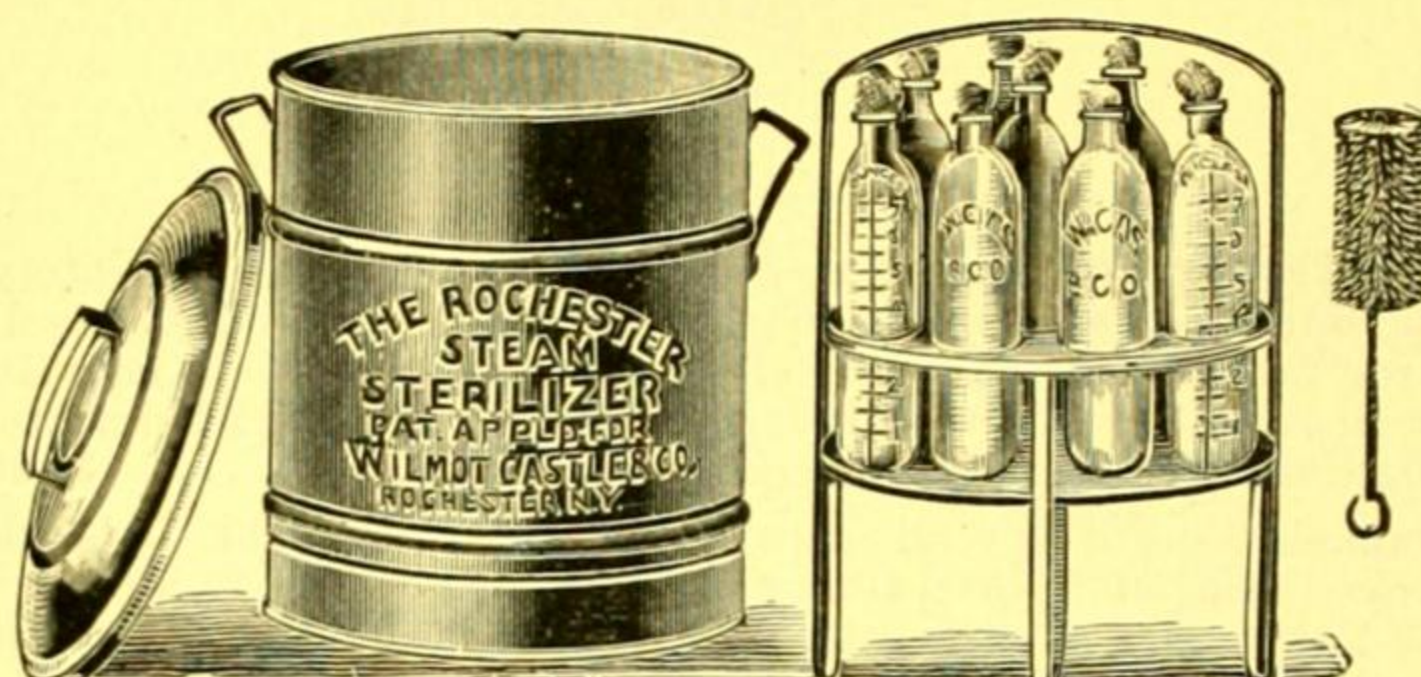
LACTOMETERS, see general heading **Hydrometers**.

9194. **MILK TESTER, Babcock, for hand power**, with enclosed cut steel spiral gears which run in grease without noise. A clamp is provided for attaching to any table. With seamless brass cups firmly secured, of the proper depth to contain hot water to submerge the bottles. Complete with two 6 inch, 18 gram, 8 per cent. milk test bottles; one 17.6 cc pipette; one 17.5 cc acid measure; one test bottle brush, and full directions for use 6.50
9196. **MILK AND CREAM TESTER, Babcock, for hand power**, same as No. 9194, but with two 6 inch, 18 gram, 8 per cent. milk test bottles; two 6 inch, 18 gram, 30 per cent. cream test bottles; one combined 17.6-18 cc pipette; one 17.5 cc acid measure; one test bottle brush, and full directions for use..... 7.50
9200. **MILK AND CREAM TESTER, Babcock, for hand power**, same as No. 9194, but four bottle size. Complete with four 6 inch, 18 gram, 8 per cent. milk test bottles; two 6 inch, 18 gram, 30 per cent. cream test bottles; one combined 17.6-18 cc pipette; one 17.5 cc acid measure; one test bottle brush, and full directions for use..... 8.00
9204. **MILK TESTERS, Babcock, for hand power**, with solid iron case and hinged cover, cut steel spiral and spur gears and seamless brass cups with tinned malleable hangers. Gearing and shafts are mounted on a separate frame easily removed for repairs or repacking with grease. Complete with one set of 6 inch, 18 gram, 8 per cent. milk test bottles, one 17.6 cc pipette, one 17.5 cc acid measure, one test bottle brush and full directions.
- | | A | B | C | D |
|-------------------------|-------|-------|-------|-------|
| No. | 6 | 8 | 10 | 12 |
| Capacity, bottles | 17.00 | 18.00 | 19.00 | 20.00 |
| Each | | | | |

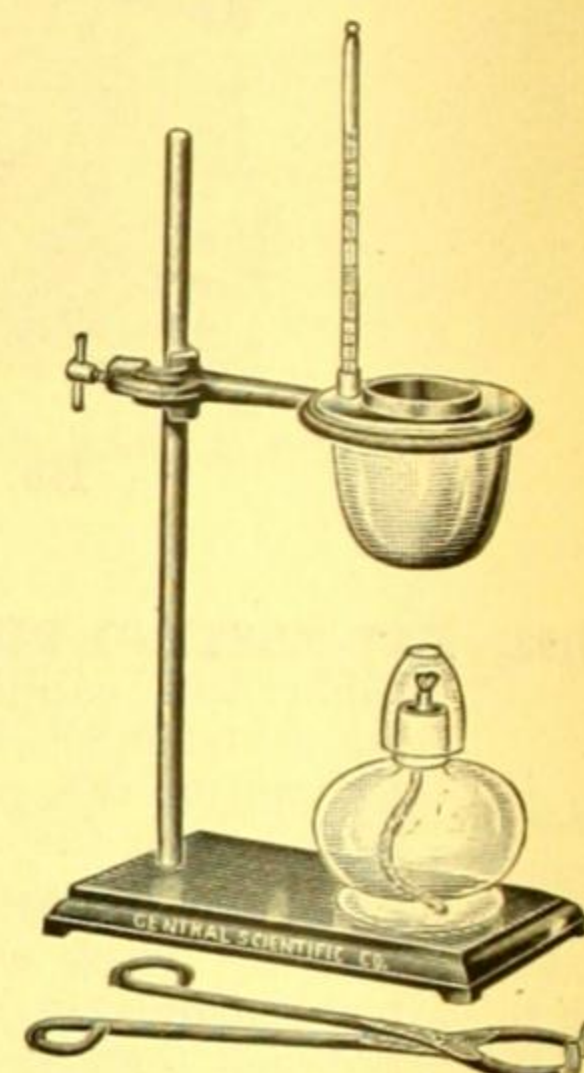
For **MILK TESTERS, Babcock, International Electric**, see under general heading **Centrifuges, International**.



No. 9238.



No. 9270.

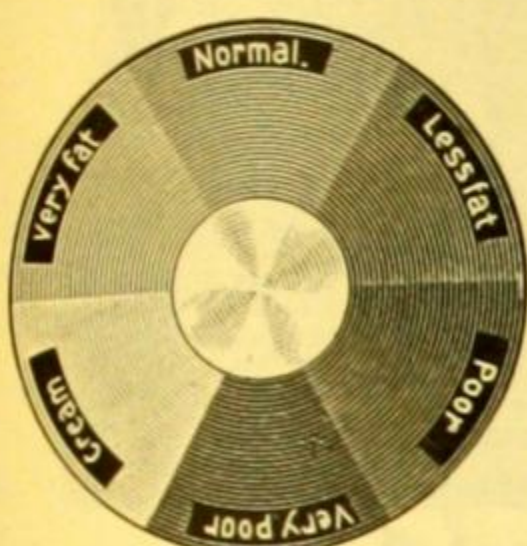


No. 9262.

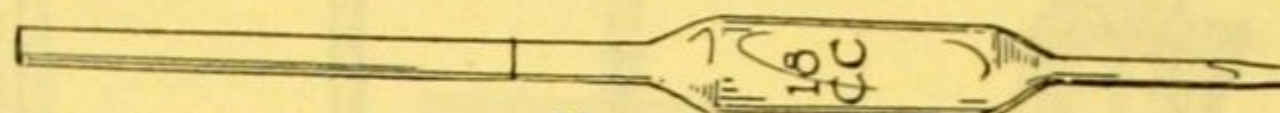
9238. **MILK TESTER, Babcock, Traveling Outfit** consisting of a four-bottle Babcock Tester No. 9200, and the following accessories:—
- | | |
|--|---------------------------------|
| 4 6-inch, 18-gram, 10% milk test bottles. | 1 floating dairy thermometer. |
| 2 6-inch, 18-gram, 30% cream test bottles. | 1 hydrometer jar, 10x1½ inches. |
| 2 double neck skim milk bottles. | 1 17.5 cc acid measure. |
| 1 cream and milk pipette (17.6-18 cc.) | 1 small Quevenne's lactometer. |
| 1 test bottle brush. | 1 set directions. |
- Complete in handsomely finished hardwood case with separate compartments for glassware and acid \$15.00
9241. **Cover**, with thumb screw and collar for Babcock milk testers Nos. 9194 to 9200 and 9238. This is the part of the gear case which attaches to the table. (Manufacturer's Number 452-1) 1.50
9262. **MOISTURE TESTER, Ames**, for moisture in butter, consisting of a jacketed paraffine container made of copper. The outside shell has a rounded bottom to expose as much surface as possible to the heat from an alcohol lamp. An aluminum sample cup fits closely within the inside shell, having contact all the way down so that the heat from the paraffine is transmitted without loss. Complete with nickel-plated support stand, special thermometer reading from 100 to 200°C, alcohol lamp, tongs for lifting the sample out, and full directions.... 7.00
9266. **PAPER, Fat Free**, for the determination of fat in milk, according to Adams' method. In boxes of 50 strips, 560x65 mm.....per box 2.80
9270. **PASTEURIZING OUTFIT**, for steam or hot water, consisting of a neatly finished vessel with convenient handles and cover, and with rack for holding eight sterilizing bottles. Beads around the sterilizing chamber mark the points to which water should be filled. Complete with bottles and brush for cleaning..... 6.50



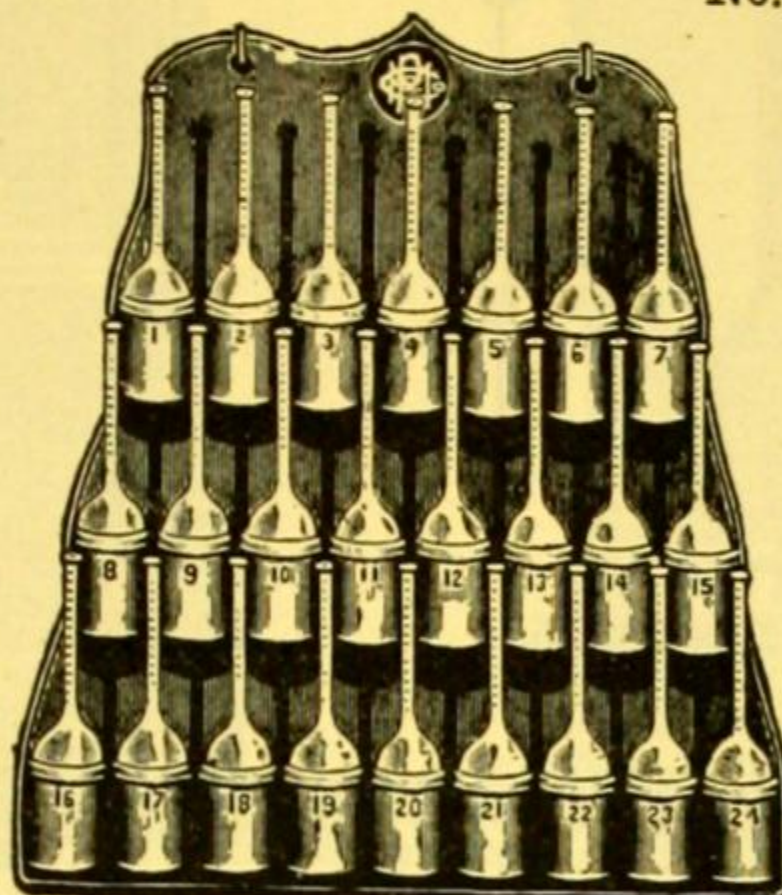
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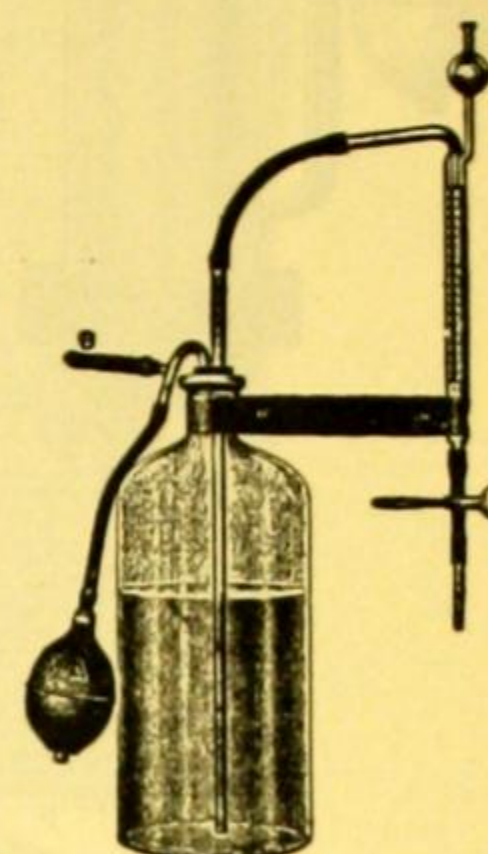
No. 9280.



No. 9282.



No. 9288.



No. 9298.



No. 9299.

9272. **PIOSCOPE, or Milk Tester, Heeren's.** For showing the richness of milk by color comparison. A set of appropriately labeled standard colors is furnished, together with a convenient means of comparing with the standards the color assumed by the sample of milk during the test. \$0.50

9276. **PIPETTES, Cream.**

No.	A	B
Capacity, cc	9	18
Each	.25	.25
Per dozen	2.50	2.50

9278. **PIPETTES, Milk.**

No.	A	B
Capacity, cc	8.8	17.6
Each	.25	.25
Per dozen	2.50	2.50

9280. **PIPETTES, Milk, 17.6 cc,** in accordance with the specifications formulated by the Bureau of Standards and adopted by the Official Dairy Instructors' Association and by the State of Indiana

Each	.35
Per dozen	3.50

9282. **PIPETTES, Milk, 17.6 cc,** in accordance with the specifications formulated by the Dairy and Food Commission of Wisconsin

Each	.35
Per dozen	3.50

9284. **PIPETTES, Milk and Cream, 17.6-18 cc combined**

Each	.30
Per dozen	3.00

PIPETTES, Volumetric, see general heading Pipettes.

9288. **RACK, for Babcock Test Bottles,** of tin. Hangs flat against the wall; the bottles stand upright and are easily filled. Capacity, 24 bottles. Without bottles

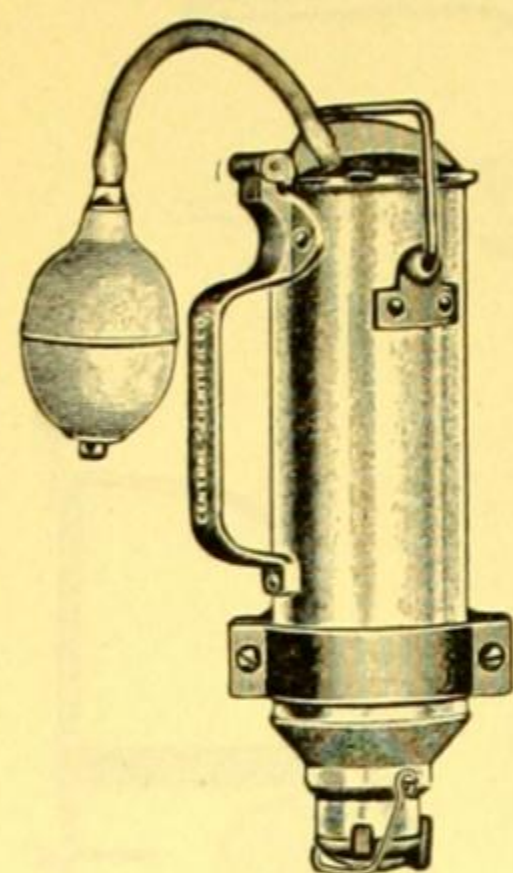
3.75

9298. **SALT TESTER FOR BUTTER, Nafis.** This apparatus is automatic, easy to manipulate, and self-adjusting, and is especially suited for rapid determination of the per cent. of salt in butter. The liquid in the graduated tube instantly readjusts itself to zero so that the only reading to be taken in using the apparatus is at the point on the graduated scale where the liquid surface is located after the test is completed. With a 10-gram sample of butter each cc of solution drawn from the burette will equal $\frac{1}{2}$ per cent. salt in the butter. Complete as illustrated together with 10-gram weight, 250 cc flask, standard solution in dry form, 25 cc pipette, porcelain cup, stirring rod, medicine dropper, beaker, 2-ounce bottle of indicator, and full directions

6.50

9299. **Stirring Rod, Nafis' Faultless,** for use in No. 9298 Salt Tester. This rod is colored to show the exact tint taken by the sample when the test is complete.

.25



No. 9308.



Nos. 9322-5.



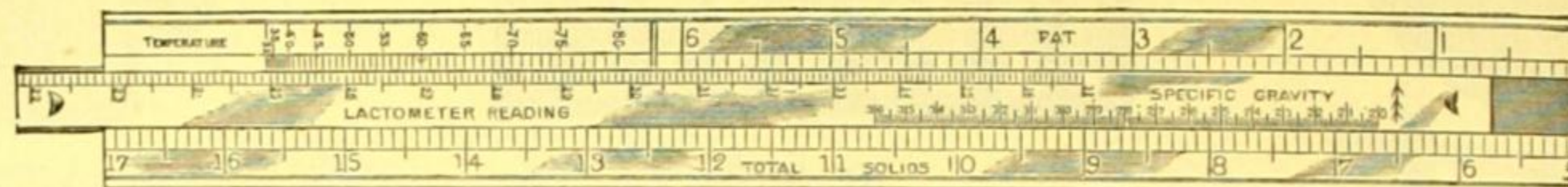
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No. 9334.



No. 9338.

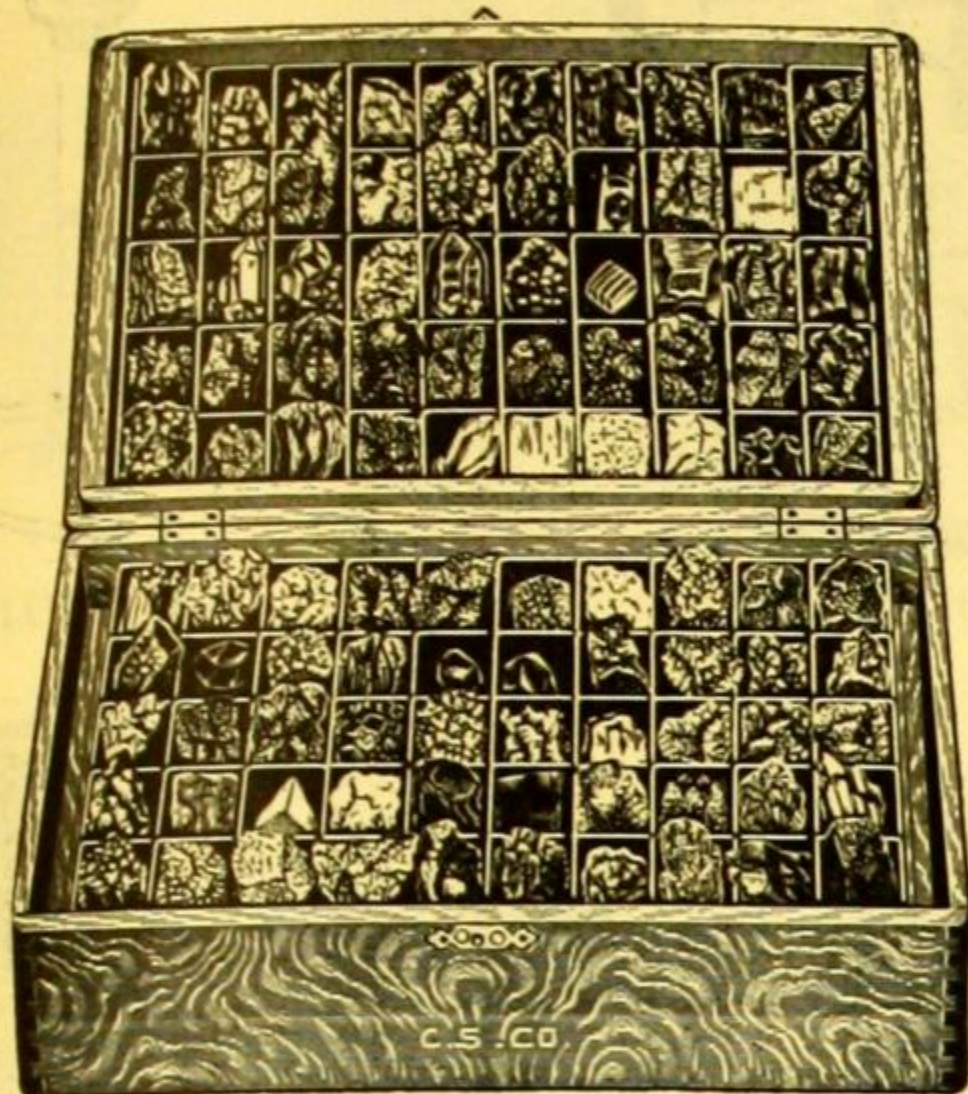


No. 9314.

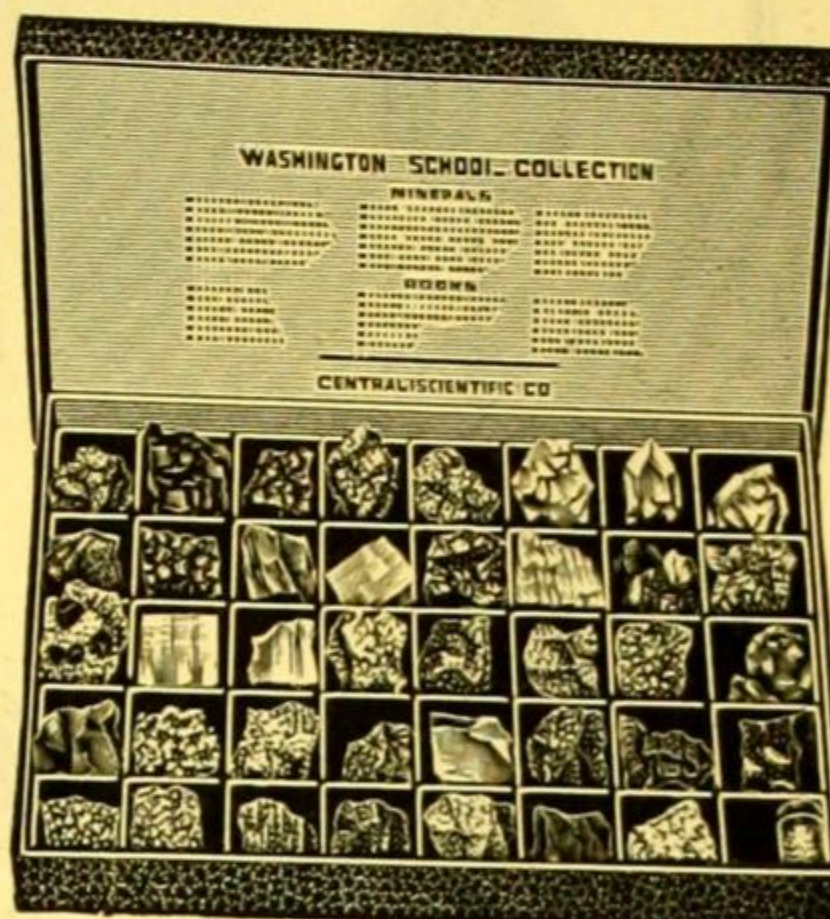
- A1800B. **SCORE CARDS**, Dairy Cattle, in tablets of 50 sheets.....Per tablet \$0.25
- A1824. **SCORE CARDS**, Market Cream, in tablets of 50 sheets.....Per tablet .25
9308. **SEDIMENT TESTER** for Milk, Pressure Type, as described by Professors Babcock and Farrington. Consists of a cylinder 2½ inches in diameter and 6 inches long, funnel shaped at the bottom and terminating in an opening about 1 inch in diameter. In the cap at the bottom is a wire gauze strainer on which a thin disk of absorbent cotton is placed. After a pint sample of milk has been filtered through the apparatus, the cotton filter, with the dirt which it has collected, is detached and allowed to dry. The amount of dirt obtained will differ with different lots of milk and disks when dry may be returned to the milk producer as evidence as to the cleanliness of the milk. Complete with 500 disks..... 15.00
9309. **Disks, Absorbent Cotton**, for use with No. 9308 Sediment Tester, in boxes of 100..Per box .65
9314. **SLIDE SCALE**, Richmond's, for calculating the total solids in milk, with scale for temperature correction of specific gravity. This slide rule will be found of great advantage and service to cheese factory men and milk inspectors, as well as those interested in the preparation and examination of milk for use of children and invalids 3.00
9316. **TABLETS**, Corrosive Sublimate, for keeping milk samples sweet. Used in making composite tests. Will color samples so that danger of mistakes is avoided. Small size will keep samples sweet for two weeks. In boxes of 50 tabletsPer box .25
9322. **TESTER**, Nafis, for Babcock Test Bottles, made of brass. To make a test, fill the bottle with alcohol deeply colored with black aniline or writing ink until it is almost opaque (this does away with the meniscus) so that the highest point is exactly even with the zero mark. Then slowly lower the Tester into the bottle until the liquid rises half way between the two sections. At that point should be the middle mark. After that point is tested for, slowly lower the entire tester into the bottle so that the liquid rises over the top of the upper section about an eighth of an inch. If the liquid is even with the top mark and was also at the middle mark, the bottle is correct. For 6 inch, 10% milk test bottles 1.00
9332. **TEST TUBES**, Butter Fat Oil, with line 5 inches from bottom.....Per dozen .90
9334. **TEST TUBES**, Cream, heavy, for samples, 5x1¼ inchesPer dozen 1.00
9338. **THERMOMETER**, Dairy, standard, for those who wish a more accurate thermometer than the ordinary. Hand-written paper scale, one degree graduation, accurate within one division of scale range 10° to 110° Fahrenheit..... .90
9340. **THERMOMETER**, Pasteurizing, with enclosed hand-written paper scale; approximate scale range 30° to 220° Fahrenheit; graduated in 2° divisions and accurate within one division of the scale. Weighted with shot, will float upright..... .90

MILLS, see Crushing and Grinding Apparatus.

MINERAL COLLECTIONS



No. 9341D.



No. 9347.

- 9341A. **MINERAL COLLECTION**, including the entire list of 128 specimens as given on page 436 of Prof. E. E. Dord's revision of Dana's "Manual of Mineralogy." Specimens average $1\frac{1}{8} \times 1\frac{1}{2}$ inches, each in a tray, the complete set being in two whitewood boxes..... \$12.50
- 9341B. **MINERAL COLLECTION**, same as No. 9341A except each specimen averages $1\frac{1}{2} \times 2\frac{1}{2}$ inches. In improved trays, without wooden box..... 35.00
- 9341C. **MINERAL COLLECTION**, same as No. 9341B except each specimen averages 3×4 inches 90.00
- 9341D. **MINERAL COLLECTION**, consisting of 216 specimens illustrating the above text. Each specimen is in a tray 1×1 inch, complete with oak box 19.50
- 9345A. **MINERAL COLLECTION**, for general geology, illustrating Prof. Hobb's "Simple Directions for the Determination of the Common Minerals and Rocks": a "Laboratory Course in General Geology." 100 specimens, including whitewood box; also 36 rocks each in tray $1\frac{1}{2} \times 2$ inches in same size wooden box as the minerals, complete 7.75
- 9345B. **MINERAL COLLECTION**, same as No. 9345A, except each specimen averages 2×3 inches. In improved trays, without wooden box..... 24.75
- We can also furnish collections for illustrating Crystallography, Physical Mineralogy, Physical Geography, Economic Geology and collections to accompany any text. Write for information.
- MINERALS**, for Blow Pipe, see Nos. 1496 and 1500 under general heading **Blowpipe Apparatus**.
9347. **MINERAL COLLECTION (Washington School Collection)**. Contains the following minerals and rocks, good size, each labeled and placed in a separate tray. The whole in a neat cloth covered case with a set of unlabeled duplicates (Set No. 9348) for student..... 5.00

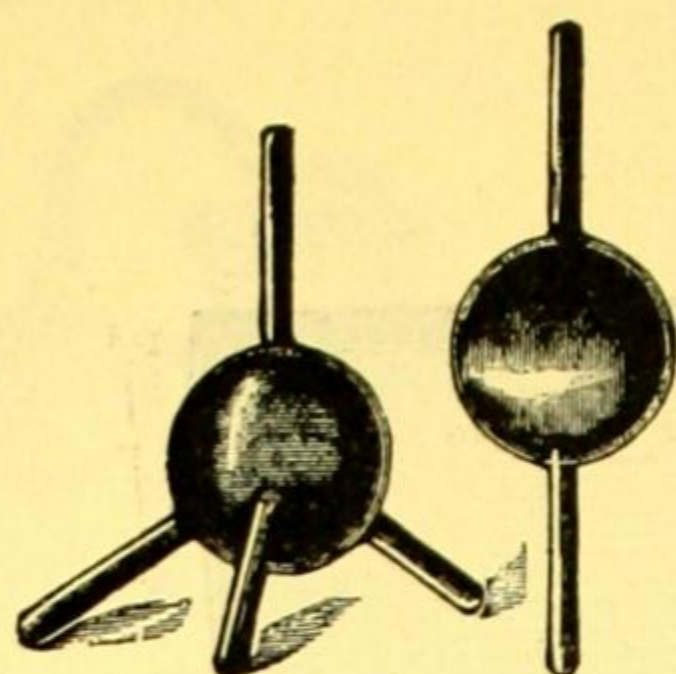
MINERALS.

- | | | |
|--------------------|-------------------|-----------------------------|
| 1. Graphite. | 8. Quartz, Milky. | 15. Amphibole (Hornblende). |
| 2. Galena. | 9. Hematite. | 16. Amphibole (Asbestos). |
| 3. Sphalerite. | 10. Magnetite. | 17. Garnet. |
| 4. Chalcopyrites. | 11. Limonite. | 18. Muscovite. |
| 5. Pyrites. | 12. Calcite. | 19. Talc. |
| 6. Fluorite. | 13. Siderite. | 20. Gypsum. |
| 7. Quartz Crystal. | 14. Orthoclase. | |

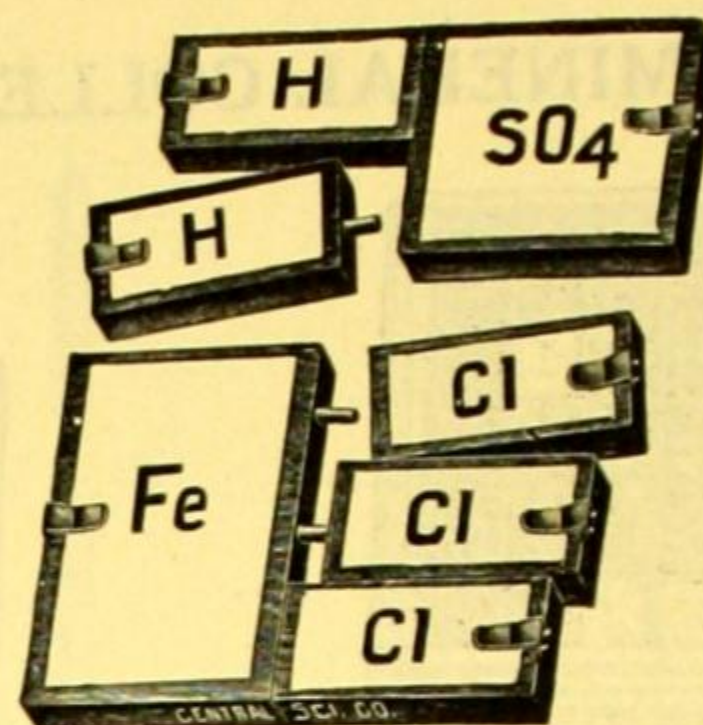
ROCKS.

- | | | |
|-----------------------|-----------------------------|--------------------|
| 1. Conglomerate. | 8. Fossiliferous Limestone. | 15. Gneiss. |
| 2. Friable Sandstone. | 9. Compact Limestone. | 16. Mica Schist. |
| 3. Red Sandstone. | 10. Peat. | 17. Quartzite. |
| 4. Potter's Clay. | 11. Lignite. | 18. Clay Slate. |
| 5. Shale. | 12. Basalt. | 19. Dolomite. |
| 6. Calcareous Tufa. | 13. Granite. | 20. Residual Sand. |
| 7. Oolitic Limestone. | 14. Diabase. | |

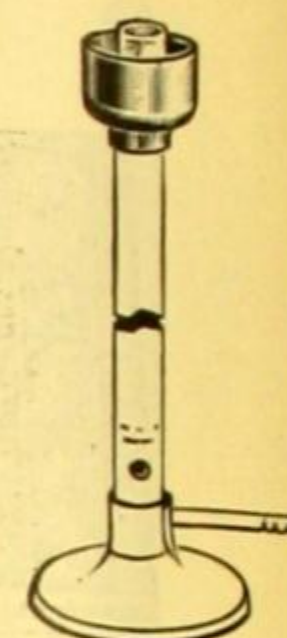
9348. **STUDENT'S COLLECTION**, consisting of smaller duplicate unlabeled specimens of Set No. 9347 for student classification..... .50



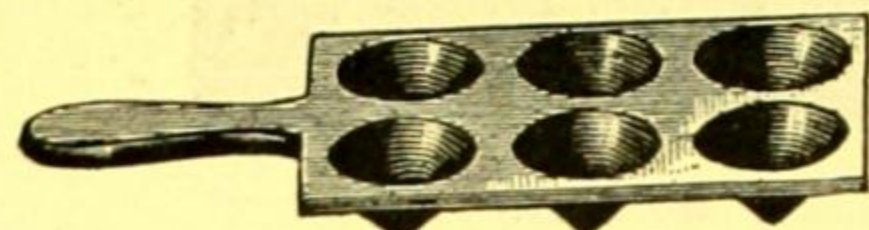
No. 9360.



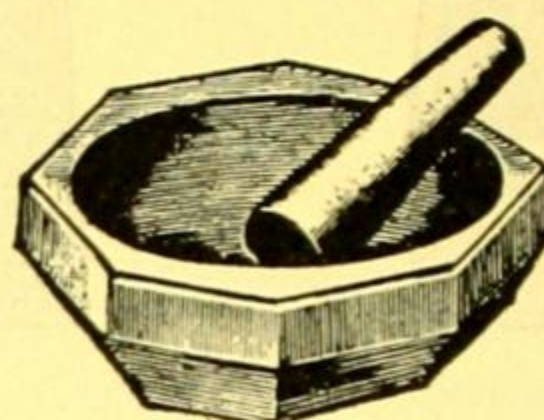
No. 9362.



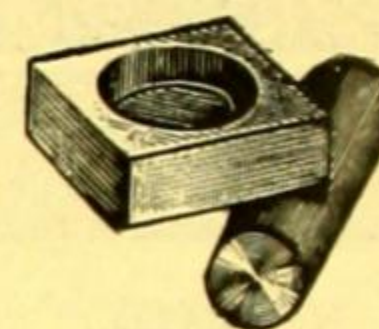
No. F7115.



No. 9374.



No. 9380.



No. 9384.



No. 9386.

MITTENS, see Gloves.

9360. **MODELS, Atomic, Kekule and Von Baeyer**, consisting of 20 black balls with four connecting posts each, 10 red balls with two connecting posts each, 30 white, 10 yellow, 10 green, 10 violet, and 10 silver colored balls each with tubular attachments to slip on the connecting posts, and 15 nickel-plated binding posts with two clamps \$27.50

9362. **MODELS, Valence, Nead's**. The blocks representing the positive elements are provided with pins which fit into corresponding holes in the blocks which represent the negative elements or radicals. On each block is a clip for holding a card on which is printed the symbol of the element represented. With these blocks valence, the idea of bonds between the atoms in combination, and equation writing are made perfectly clear. The set includes 12 blocks for univalent elements, 6 for bivalent, and 4 for trivalent, half of each being positive, and 100 printed cards for symbols of elements and radicals. 7.25

MOIST CHAMBERS, see Culture Dishes.

MOISTURE TESTERS, see Grain Testing Apparatus.

MOLD, Briquette, see Asphalt Testing Apparatus; Cement Testing Apparatus.

MOLDS, Cement, see Cement Testing Apparatus.

9374. **MOLD, Pouring**, cast iron, with wood handle and round holes, for crucible and scorification assays. Number of cavities, 6.....Each 1.00

MOLECULAR WEIGHT DETERMINATION APPARATUS, see Physical Chemistry Apparatus.

F7115. **MONOCHROMATIC FLAME ATTACHMENT** for Bunsen burners. A small reservoir which slips over the top of the burner is provided with an asbestos wick at the center. This wick surrounds the mouth of the burner closely and feeds up to the flame any solution placed in the reservoir. The flame is therefore continuously colored with the characteristic color of the salt which is in the solution, and frequent renewals are not necessary, as only a small portion of the dissolved substance is consumed. As the water evaporates more is easily supplied. For any burner with $\frac{7}{16}$ -inch tube..... 1.50

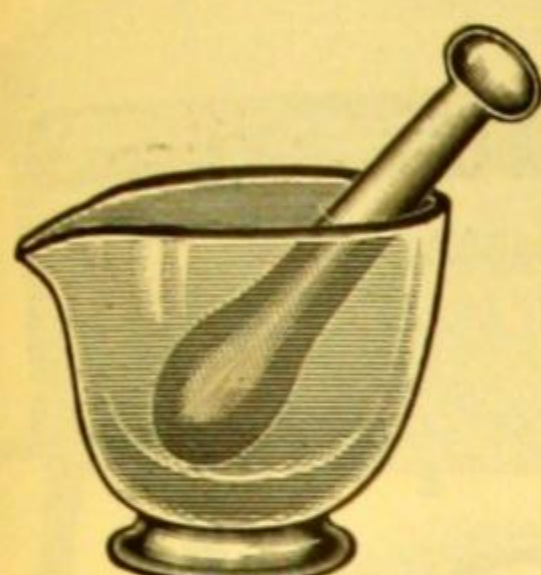
9380. **MORTARS, Agate**, selected quality, with agate pestles.

Diameter outside, mm.....	50	60	70	100	125
Each	3.00	3.80	5.00	12.00	18.00

9384. **MORTAR, Diamond, Leed's Form**, of hardest steel. Pestle 50x15 mm..... 3.50

9386. **MORTARS, Diamond, Plattner's**, of hardest steel.

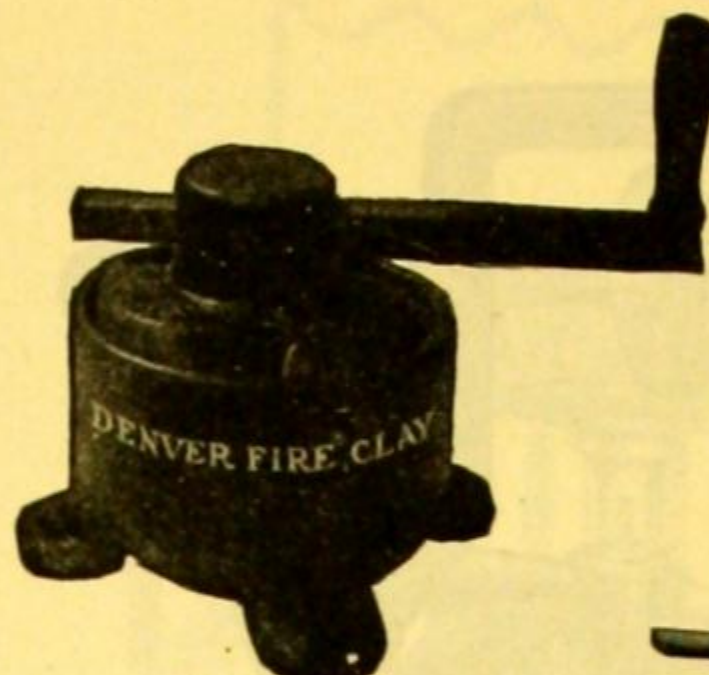
No.	A	B
Diameter of pestle, mm.....	15	25
Each	5.00	7.50



No. 9388.



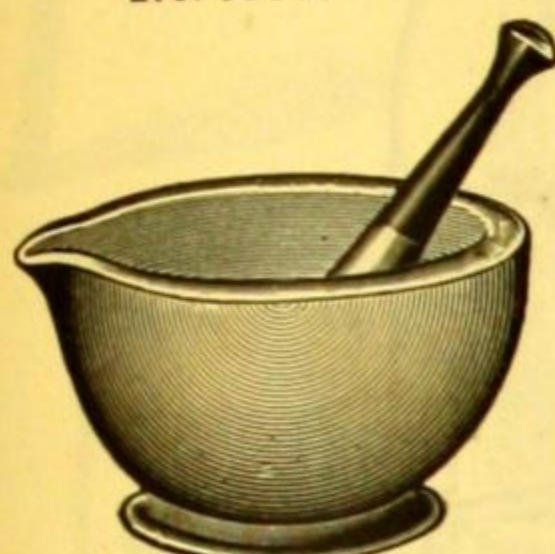
No. 9390.



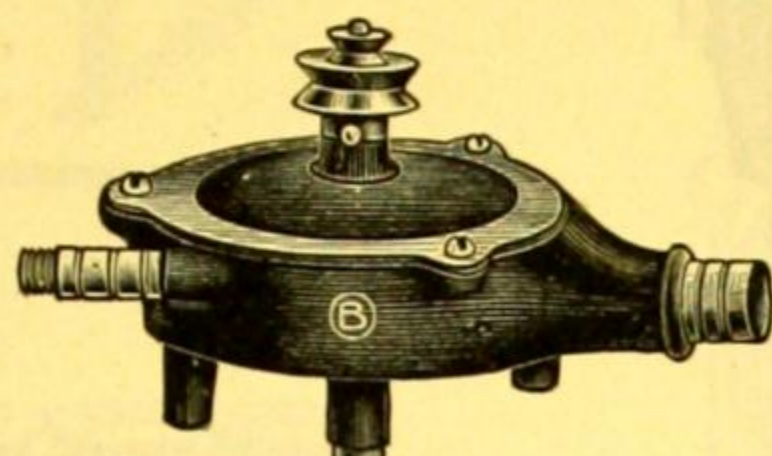
No. 9394.



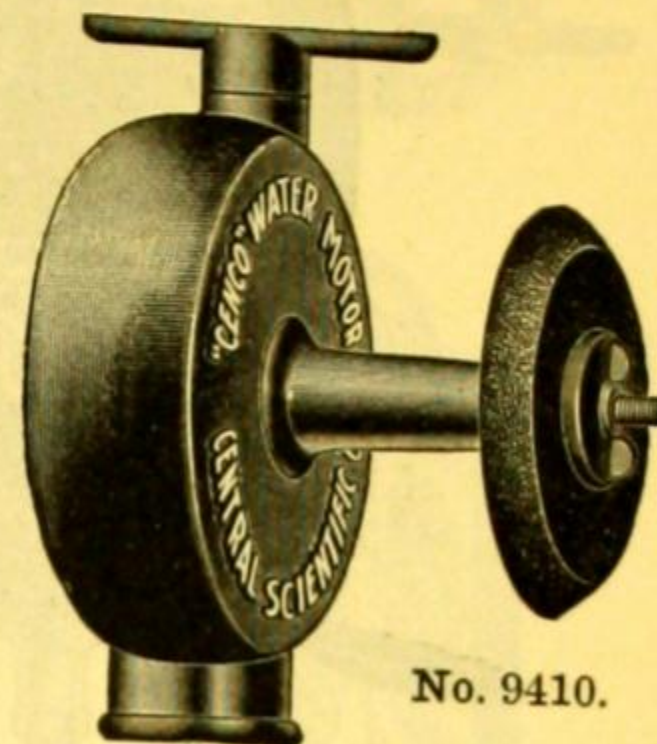
No. 9396.



No. 9402.



No. 9408.



No. 9410.

9388. **MORTARS, Glass, with pestle.**

No.	A	B	C	D
Capacity, ounces	2	4	8	16
Diameter outside, inches.....	2 3/4	4	4 1/2	5
Each	\$0.45	.60	.70	1.20

9390. **MORTARS, Iron, vase shape, heavy, with pestle.**

No.	A	B	C	D
Capacity, pints	1	2	4	1 gal.
Size, inches	4 1/2 x 5	5 1/2 x 6	6 1/2 x 6	8 x 7
Each	1.20	1.60	2.40	4.00

9394. **MORTARS, Iron, Buck's, for grinding and amalgamating.** By rotation of the muller, a large sample of quartz may be ground in contact with mercury.

No.	A	B
Diameter outside, inches.....	6 1/2	8 1/2
Total weight, pounds.....	30	76
Weight of muller, pounds.....	16	49
Each	12.00	18.00

9396. **MORTARS, Porcelain, with spout and pestle; glazed outside, rough inside.**

Outside diameter, mm.....	65	80	100	130	150	185	213
Each	.36	.50	.60	1.00	1.30	1.60	1.80

9402. **MORTARS, Wedgewood, acid proof, pestle with wood handle.**

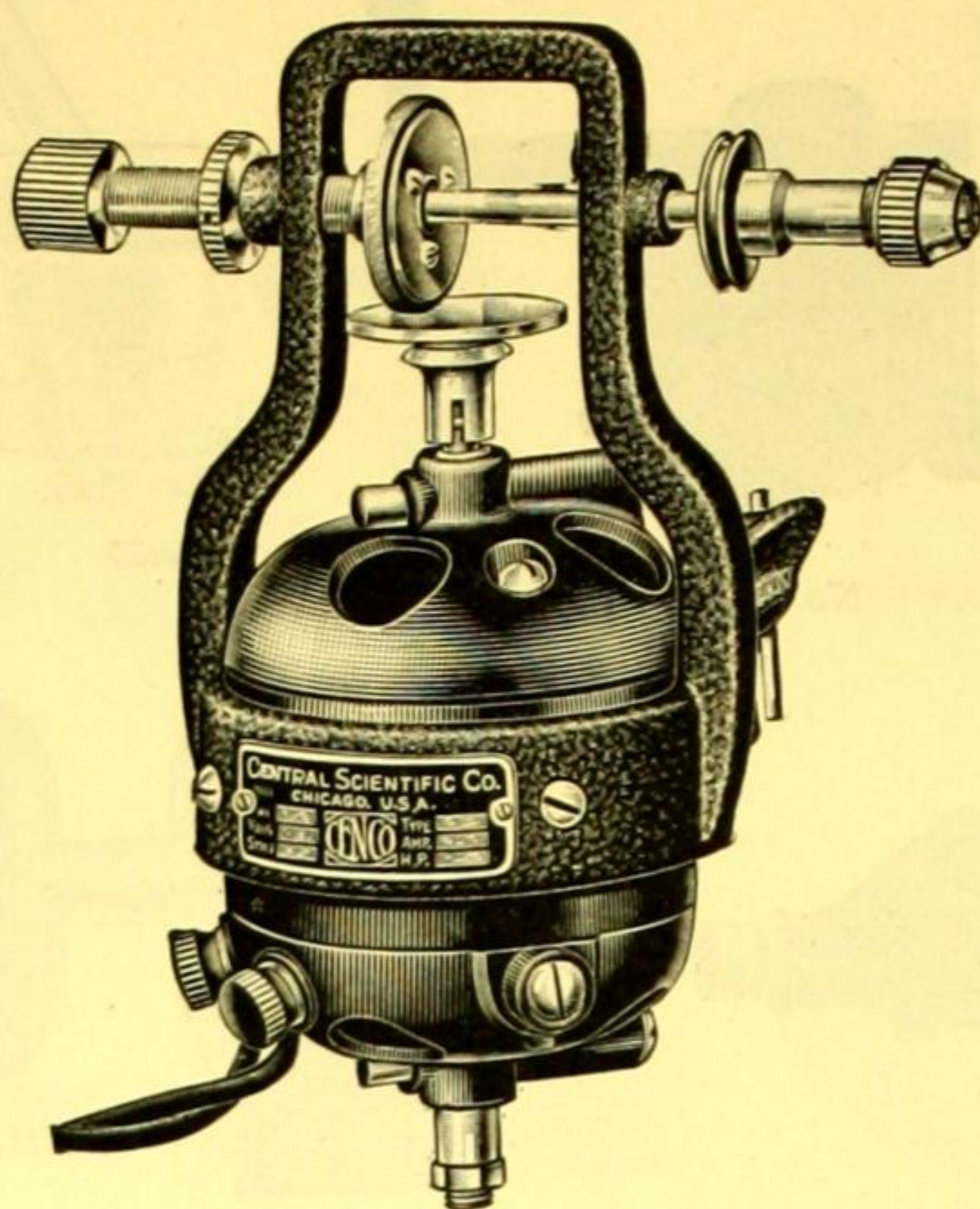
No.	0000	00	1	3	5
Diameter outside, inches.....	3	4	5	6 3/8	8
Each	1.00	1.30	1.60	2.20	3.00

MORTAR, Automatic Grinding, see **Crushing and Grinding Apparatus.**MOTORS, Electric, see **Electrical Instruments.**MOTOR-GENERATORS, see **Electrical Instruments.****MOTORS, WATER**9408. **MOTOR, WATER, 5 inches in diameter; may also be used with steam or compressed air. Has a two-speed steel pulley for 7/32-inch round belt. Attains the following speeds, depending on the water pressure.**

Water pressure, lbs.....	20	30	40	50	60
No. of r. p. m.....	2300	2800	3400	3850	4200

This motor may be attached to an ordinary apparatus stand and used for either stirring or shaking. The inlet pipe is threaded 1/4 inch I. P. thread 8.75

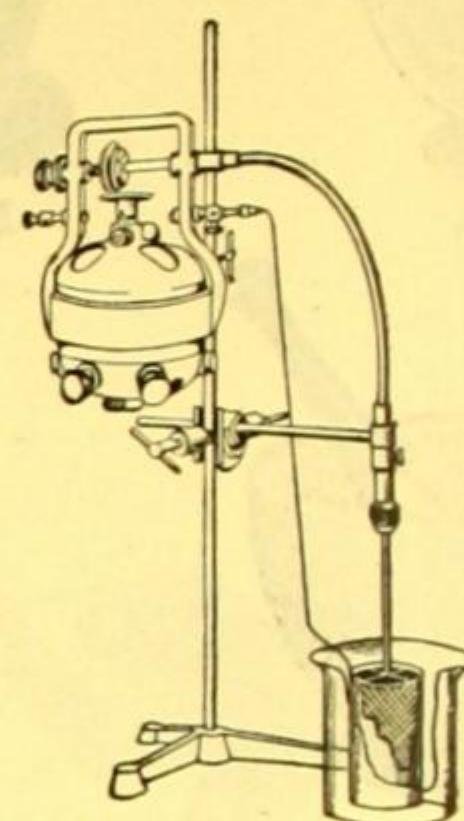
9410. **MOTOR, CENCO WATER, a reliable motor made by one of the largest manufacturers of water motors and fully guaranteed. This motor will be found useful for power in grinding, buffing, etc., and as a test of efficiency in the laboratory, also in connection with bottle washing brushes, etc., for the rapid cleaning of bottles, flasks, etc. Diameter 4 inches, weight 5 pounds. With 80 pounds water pressure will develop 1/8 h. p. when connected with 1/2-inch house pipe. Complete with 4-inch beveled face emery wheel, one felt buffing wheel for brass and silver, one cake of brass and silver polish, one grooved wood pulley for 1/4-inch round belt (see No. F2857), and coupling for threaded faucet..... 6.25**



No. 12860.



No. 9450A.

No. 12860 as Anode Rotator
with Flexible Shaft.

9412. **MOTOR, CENCO WATER.** Same design as No. 9410. Diameter, 6 inches; weight, 7 pounds. With 80 pounds water pressure will develop $\frac{1}{4}$ h. p. when connected with $\frac{1}{2}$ -inch house pipe. Complete with grooved wheel for $\frac{7}{32}$ -inch round belt (see No. F2857), and coupling for threaded faucet, but without other accessories..... \$8.75
9416. **MOTOR, CENCO WATER, Demonstration Form.** Same as No. 9410 Water Motor, but with one side of glass so that the action of the water wheel may readily be inspected..... 9.75

ACCESSORIES FOR CENCO WATER MOTORS.

9417. **Universal Coupling** for plain faucet (state outside diameter)70
9422. **Emery Wheel**, beveled edge, 4-inch diameter, $\frac{5}{16}$ -inch hole. Regularly furnished with No. 9410 1.40

Note:—The above emery wheel is for use on Nos. 9410 and 9416 Cenco Water Motors. It may be used on No. 9412 Cenco Water Motor if a Stud Shaft, supplied on order, is used.

12860. **MOTOR STIRRER, Cenco Universal**, a friction-drive motor stirrer possessing the new feature of speed control. Adapted to a variety of laboratory uses including electro-analysis, stirring of organic preparations, titration, etc. For more complete description see general heading **Stirrers**, or send for bulletin No. 85.

No.	A	B	C	D
	A. C.		D. C.	
For volts	110	220	110	220
Each	35.00	37.00	35.00	37.00

12861. **Flexible Shaft**, 12 inches long, for use with No. 12860, with guide to provide bearing for lower end, and with solid chuck to hold $\frac{1}{4}$ inch rods. Can be attached to support by any ordinary right angle clamp (see our No. 2914)..... 4.00

MOUSE JARS, see **Animal Holders**.

MUFFLE FURNACES, see **Furnaces**.

MUFFLES for Gas and Oil Heated Furnaces, see **Furnaces, Muffle**.

MUFFLES, Alundum, see note under **Muffles, Opaque Fused Silica**.

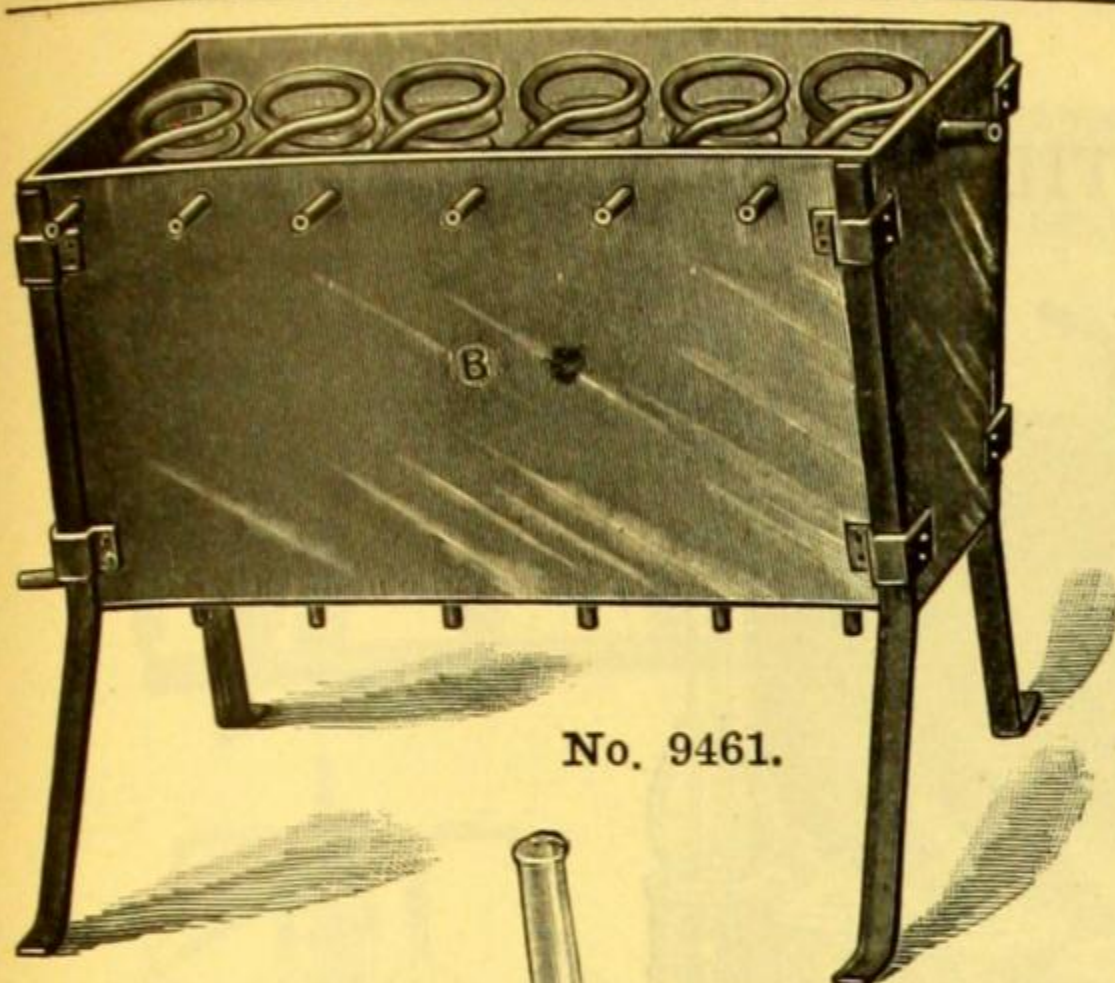
MUFFLES, Clay, all kinds and sizes, send for special bulletin giving sizes and prices.

MUFFLES, Opaque Fused Silica, see note below.

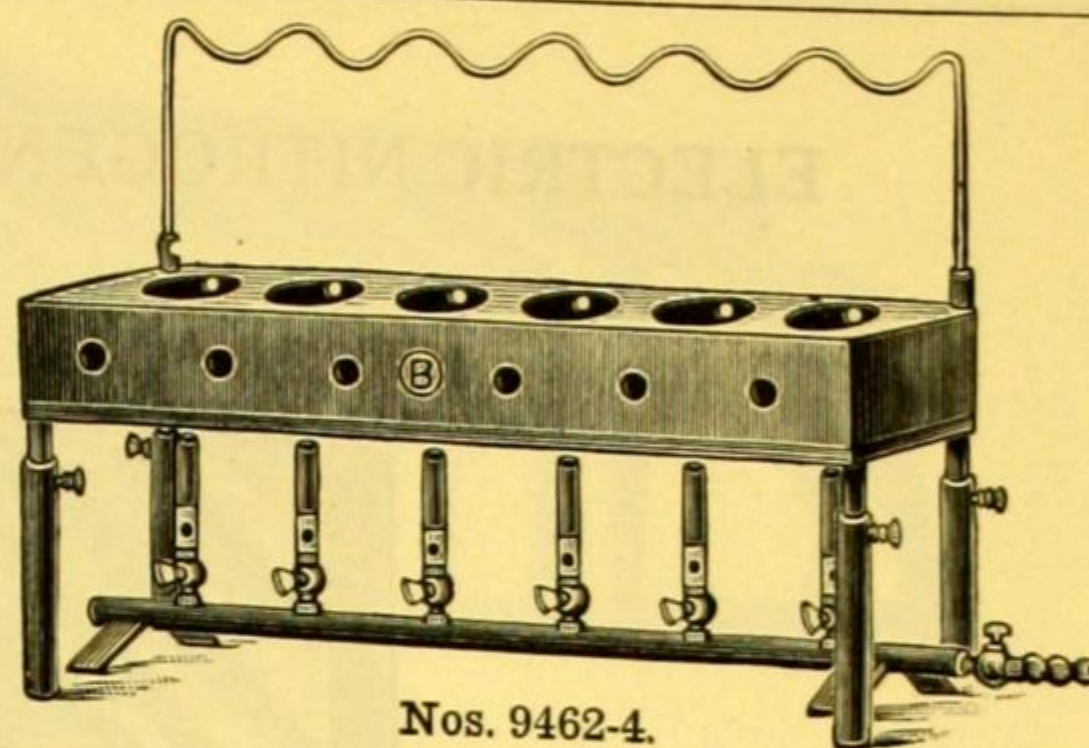
Note:—Owing to the great variety of sizes and shapes of muffles in use throughout the country, we have made no attempt to offer a complete list in this catalog. We shall be very glad to quote prices upon request upon muffles made of alundum, clay or silica. As it is very important that the muffle shall fit the space for which it is ordered, we urge that orders or requests for prices be accompanied by (1) a list of dimensions both outside and inside, (2) a statement as to whether both ends are open or one closed, and (3) a sketch showing the exact shape of the cross section of the old muffle.

MUSEUM JARS, see **Jars**.

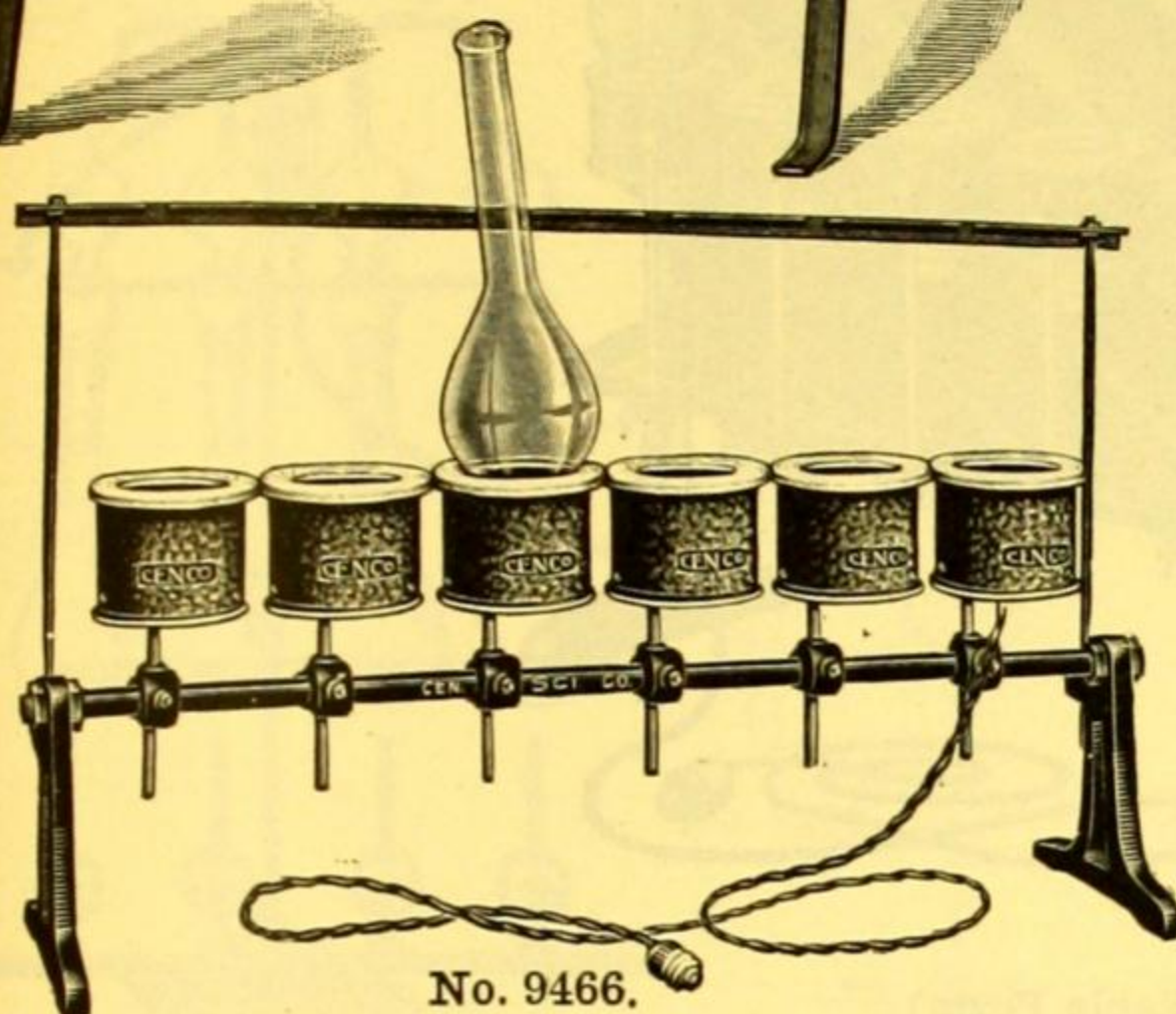
- 9450A. **NAIL SET**, made of high grade steel, 4 inches long, both ends hardened, centers nicely knurled, tips concaved, tops oval and the size exact. Diameter at tip, $\frac{1}{16}$ inch..... .15



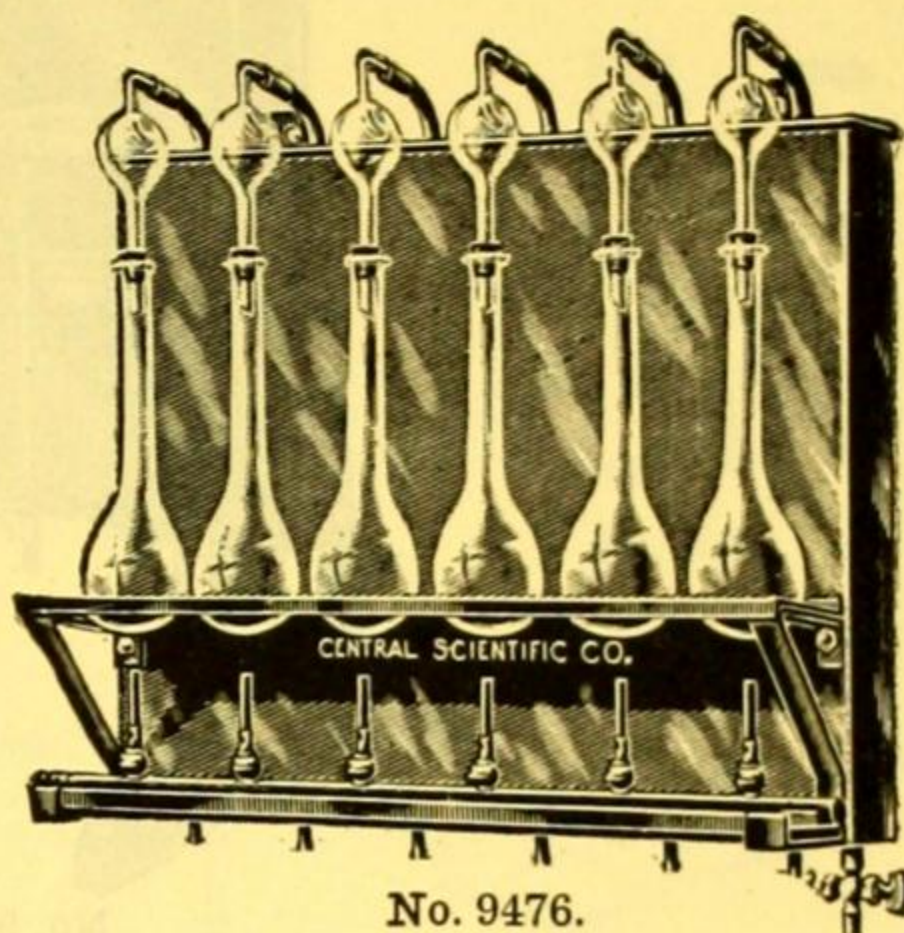
No. 9461.



Nos. 9462-4.



No. 9466.

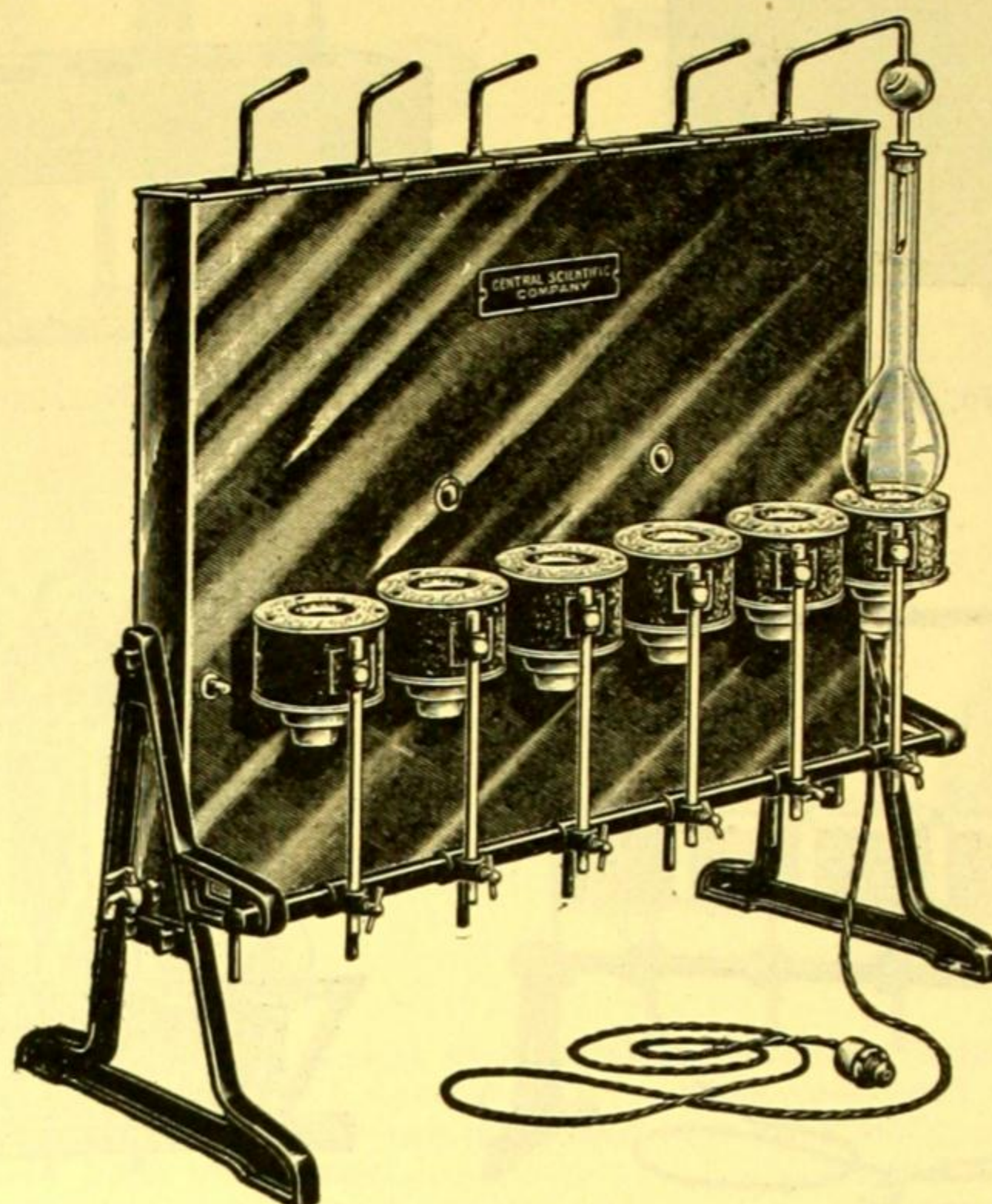


No. 9476.

NITROGEN DETERMINATION APPARATUS

9460. **KJELDAHL APPARATUS** for Nitrogen Determinations, consisting of Condenser No. 9461 of polished copper with block tin tubes and Digestion Shelf No. 9462 of sheet iron, with burners provided with individual stop-cocks. Without glass flasks.....
- | | A | B |
|------------------------|---------|-------|
| Number of burners..... | 6 | 10 |
| Each | \$57.50 | 93.50 |
9461. **KJELDAHL CONDENSERS** only of No. 9460, made of polished copper tin lined, with coils of pure block tin tubing. Width at top, 6½ inches; depth, 14 inches; height including legs, 24 inches. No.....
- | | A | B |
|----------------------|-------|-------|
| Number of coils..... | 6 | 10 |
| Length, inches..... | 30 | 50 |
| Each | 36.00 | 60.00 |
9462. **KJELDAHL DIGESTION SHELVES** only of No. 9460, made of sheet iron with iron rod to support flasks, mounted on adjustable legs. A special feature of this shelf is the separate stop-cock key provided to prevent burning the fingers when adjusting the flame. Height of apparatus to top of sheet iron shelf, 9½ inches; width, 5½ inches. No. ...
- | | A | B |
|------------------------------|-------|-------|
| Number of burners..... | 6 | 10 |
| Length of shelf, inches..... | 30 | 50 |
| Each | 21.50 | 33.50 |
9466. **KJELDAHL DIGESTION SHELVES, Electrically Heated**, provide even and constant heat for Kjeldahl digestions and distillations, with individual heating units which are the same as employed in the Nos. 9481 and 9482 Electrically Heated Kjeldahl Distilling Apparatus described on page 358. The heaters are provided with transite tops with beveled openings upon which the flasks rest and can be lowered in their supports to permit the removal of the flasks. Each heater is provided with an independent cord and plug so that any number can be used at one time. No.....
- | | A | B | C | D |
|------------------------|-------|-------|-------|-------|
| Number of heaters..... | 6 | 6 | 10 | 10 |
| For volts | 110 | 220 | 110 | 220 |
| Each | 43.00 | 43.00 | 67.00 | 67.00 |
9476. **KJELDAHL DISTILLING APPARATUS, wall form.** All working parts of the apparatus are readily accessible from the front. The burners are provided with stop-cocks for individual regulation so that any or all of the burners may be used at once. The condenser tank is of heavy copper with block tin condenser tubes. With 6 burners but without glassware 65.00
9478. **KJELDAHL DISTILLING APPARATUS**, same as No. 9476, but with burners for gasoline gas 67.50
9480. **KJELDAHL DISTILLING APPARATUS**, same as No. 9476, but with supports to stand on the table. With 6 burners..... 67.50

ELECTRIC NITROGEN DISTILLING APPARATUS



No. 9482 (Table Form).

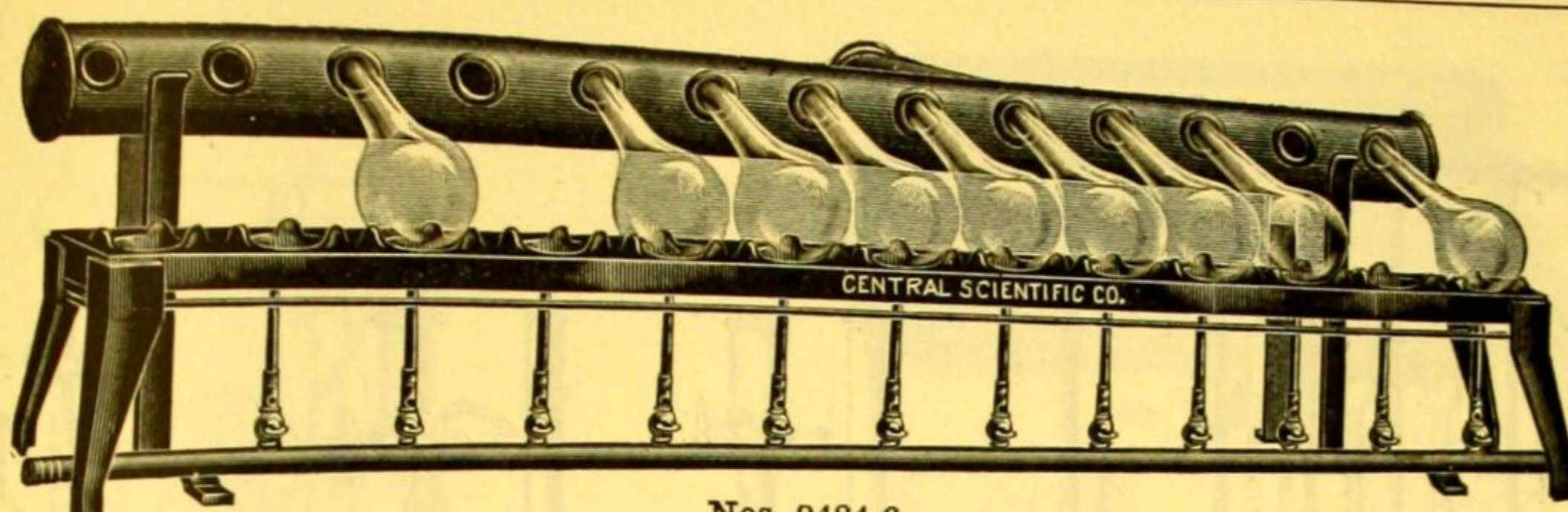
9481. **KJELDAHL DISTILLING APPARATUS, Cenco, Electrically Heated, Wall Form**, similar in all respects to the No. 9476 Kjeldahl Distilling Apparatus except in the method of heating. The heating units are the same as we employ in our popular No. 9647 **Cenco Electric Heater**. They have been demonstrated to be superior in efficiency because of the character of refractory employed and because of their shape and construction. For these reasons they are very economical in the use of electric current, requiring only 250 watts on 110 volts to distill the ammonia over at the usual rate.

No rheostats are included in the heaters, the elements having been wound with the size of wire required to maintain the proper rate of distillation within the limits of voltage fluctuation usually experienced. The heaters are provided with transite tops with bevelled openings upon which the flasks rest, and can be lowered to permit removal of the flasks. As the flasks do not come in direct contact with the heating elements, the danger of breakage is reduced to a minimum. In case of breakage of a flask and the spilling of its contents on the heating element, the latter may be removed, rinsed out with water and allowed to dry, when it will be found as serviceable as ever. Each heater is provided with an independent connecting cord, so that any number may be used at one time. The heaters may be removed entirely from the apparatus and used for many other purposes in the laboratory.

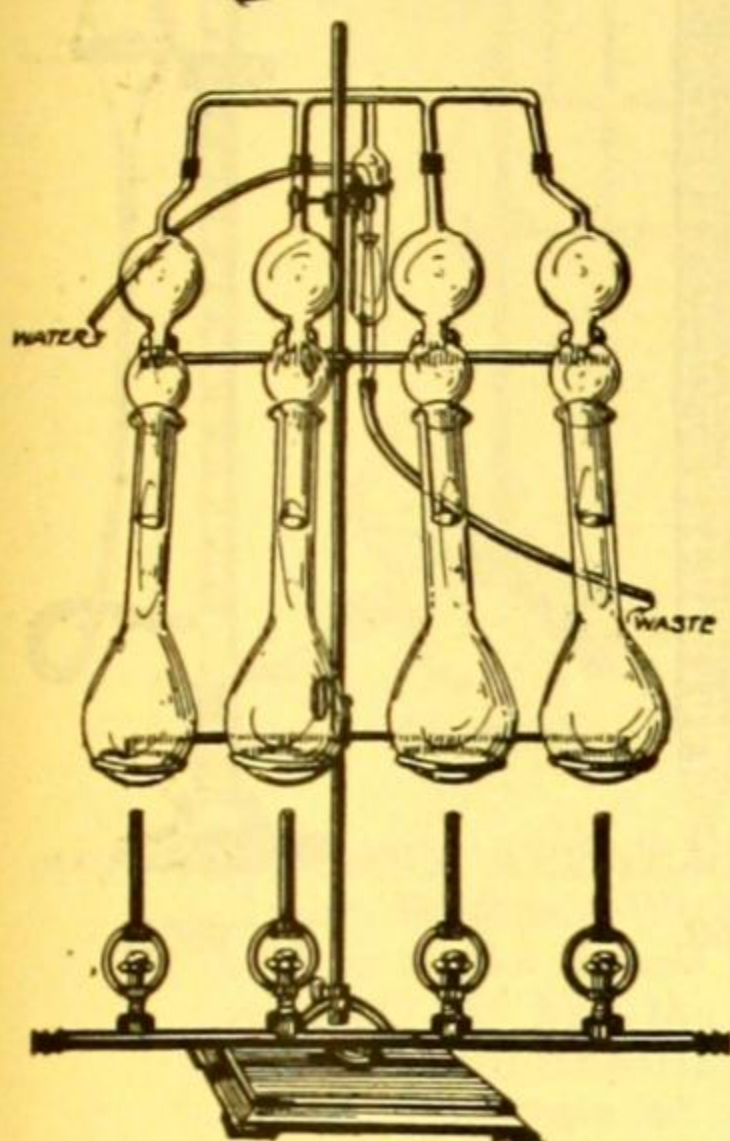
We are now making all of our Nitrogen Distillation Apparatus so that either gas burners or electric heaters may be used, the change from one to the other being readily made.

Complete as described, without supports, but with hooks for hanging on the wall, **without glassware**.

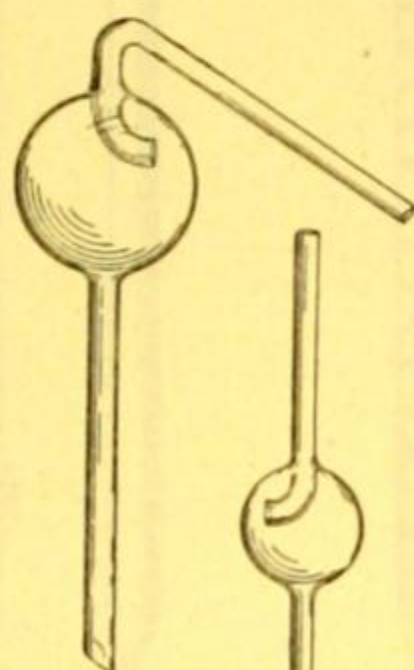
No.	A	B
For volts	110	220
Each	\$103.00	108.00
9482. KJELDAHL DISTILLING APPARATUS, Cenco, Electrically Heated, Table Form , same as No. 9481, but with supports to stand on table. Without glassware.		
No.	A	B
For volts	110	220
Each	105.00	110.00
9483. Electric Heater, only for Nos. 9481 and 9482.		
No.	A	B
For volts	110	220
Each	9.00	10.00



Nos. 9484-6.



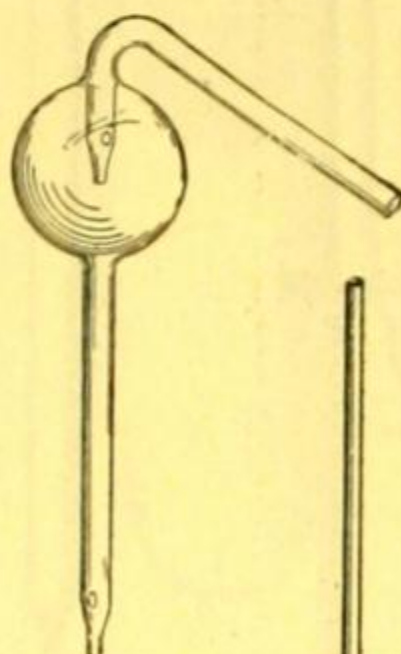
No. 9490.



No. 9498.



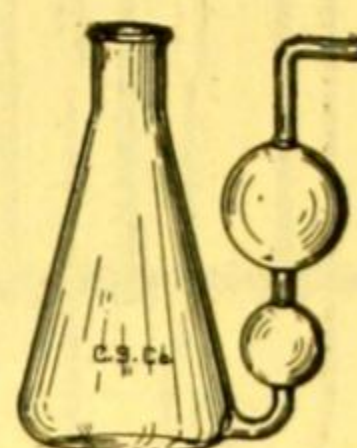
No. 9500.



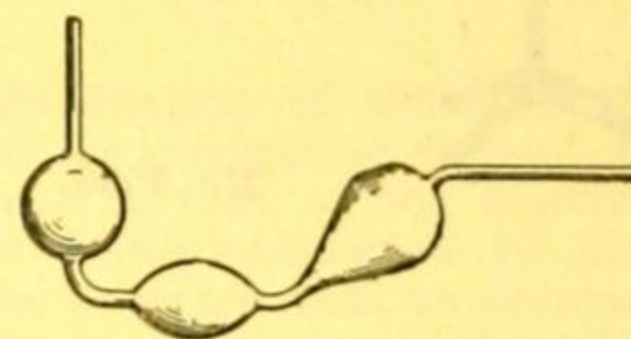
No. 9502.



No. 9512.



No. 9518.



No. 9524.

9484. **KJELDAHL DIGESTION SHELVES**, Johnson's, consisting of a shelf of iron about 6 inches wide and 8½ inches high, with holes 4½ inches from center to center. The necks of the flasks rest in holes in a large lead tube to be connected with a chimney so that all fumes are carried away. Complete with Bunsen burners, with stop-cocks with separate key, but without flasks, lead pipe, or support for pipe.

No.	A	C
Number of burners.....	6	13
Approximate length, inches.....	30	65
Each	\$25.00	35.00

9485. **Lead Tubing** for use with No. 9484, inside diameter, 4 inches.....Per foot .80

9486. **Lead Tubes** for No. 9484, inside diameter 4 inches, complete with holes for necks of flasks, and with support. With outlet tube 12 inches long, located in middle of long tube, unless specified otherwise in ordering.

No.	A	C
Number of holes.....	6	13
Each	15.00	20.00

9490. **KJELDAHL DIGESTION APPARATUS**, Sy's Fumeless, permitting digestions to be made without the use of a hood, provided a water supply and drain are available. The glass filter pump effectually disposes of the fumes as they are generated. Complete with support stand, clamps, quadruple burner, filter pump, four bulb tubes and four 500 cc Kjeldahl flasks of Pyrex glass. (See Journal of Industrial and Engineering Chemistry, Vol. IV, No. 9, for September 1912.)

9498. **KJELDAHL CONNECTING BULB**, original design. Diameter, about 58 mm..... .55

9500. **KJELDAHL CONNECTING BULB**, same as No. 9498, but with straight connecting tube for bending to any angle..... .50

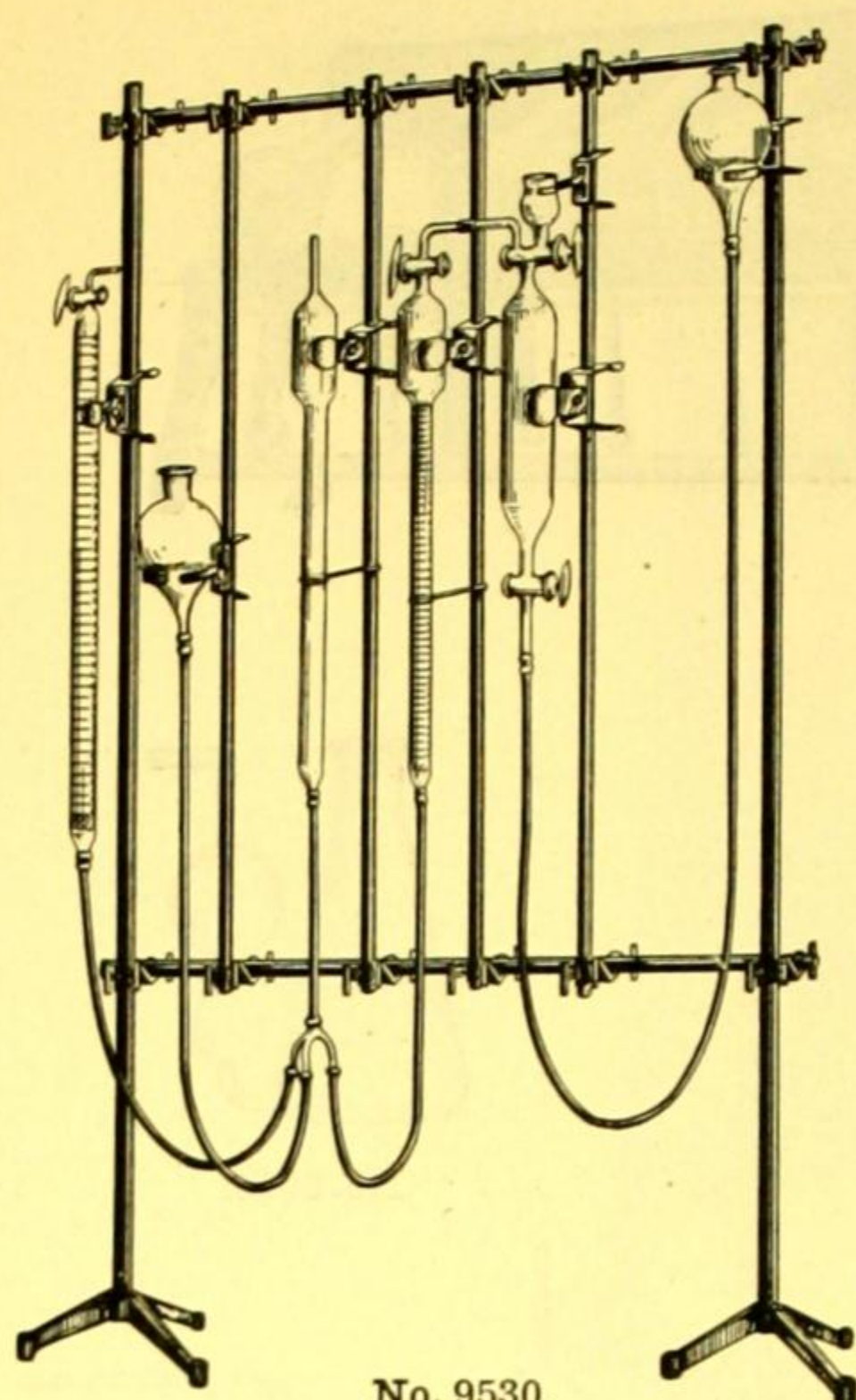
9502. **KJELDAHL CONNECTING BULB**, as modified by Hopkins. (See Journal of American Chemical Society No. 3, 1896.)..... .55

9512. **DELIVERY BULB TUBE**, for Kjeldahl Apparatus. Prevents sucking back of condensed liquid from receiving flask..... .25

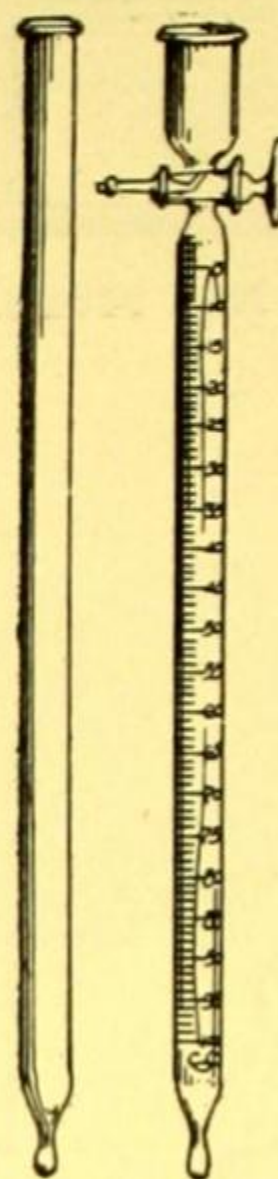
For **KJELDAHL FLASKS**, see Flasks.

9518. **NITROGEN BULB**, Fresenius' 1.10

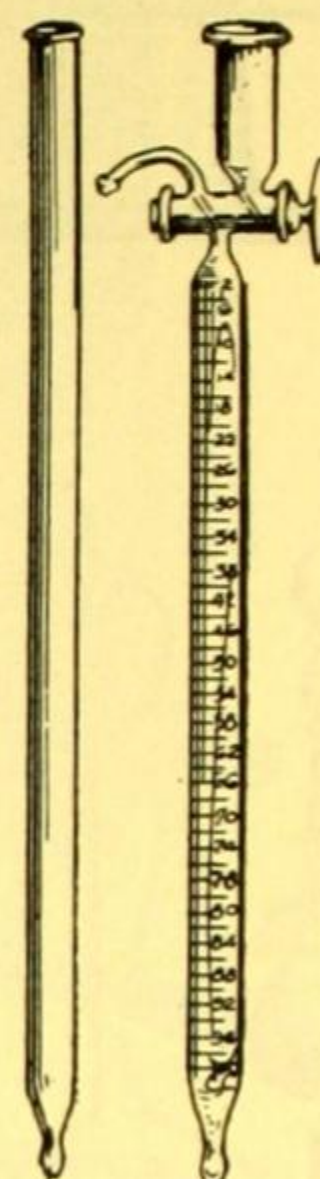
9524. **NITROGEN BULB**, Will-Varrentrap's, with three bulbs70



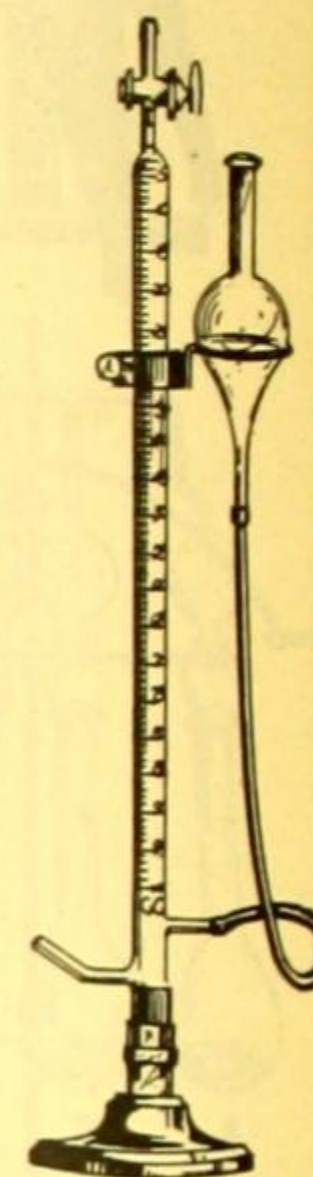
No. 9530.



No. 9546.



No. 9550.



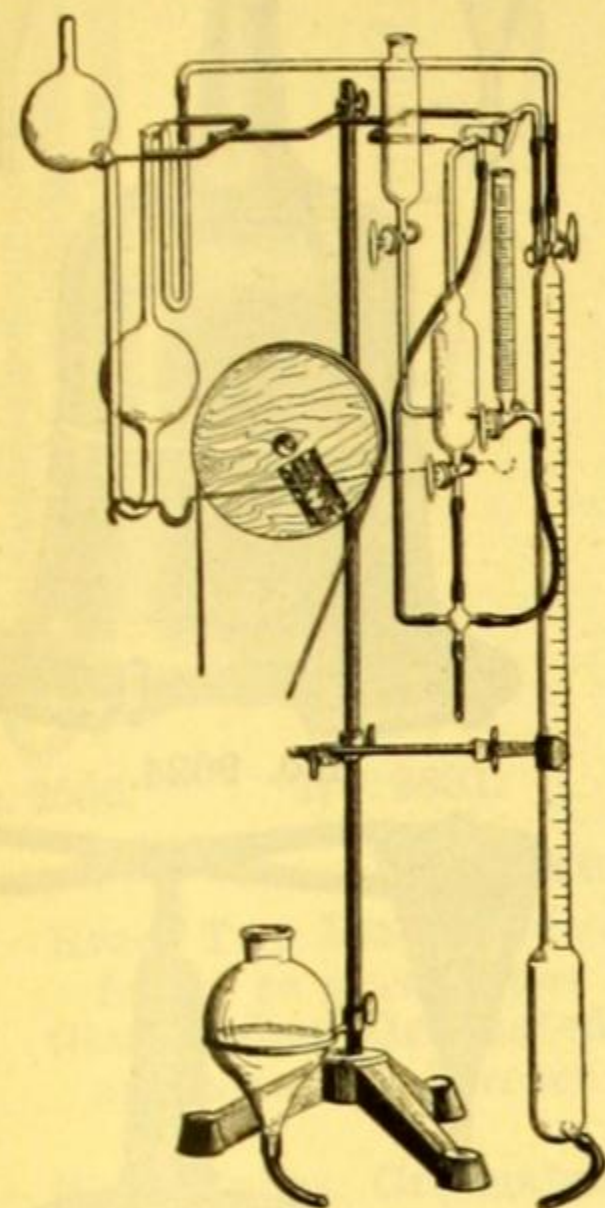
No. 9556.

NITROMETERS

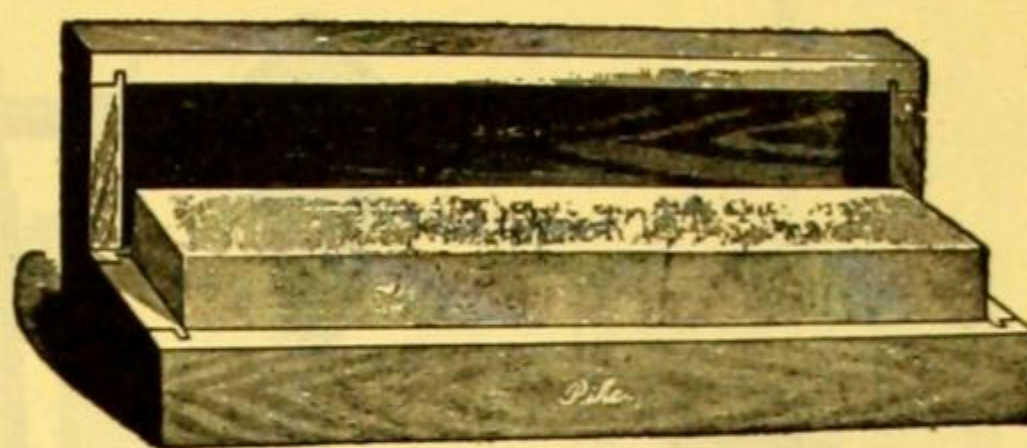
9530. **NITROMETER**, Du Pont, latest modification. Used by manufacturers of explosives for the analysis of nitric acid, etc. Complete with glass parts, iron stand and rubber connections, as illustrated. (See Technical Paper 160 of the United States Bureau of Mines.)..... \$75.00
9531. **Glass Parts**, only of No. 9530..... 25.00

Parts and Accessories for No. 9530

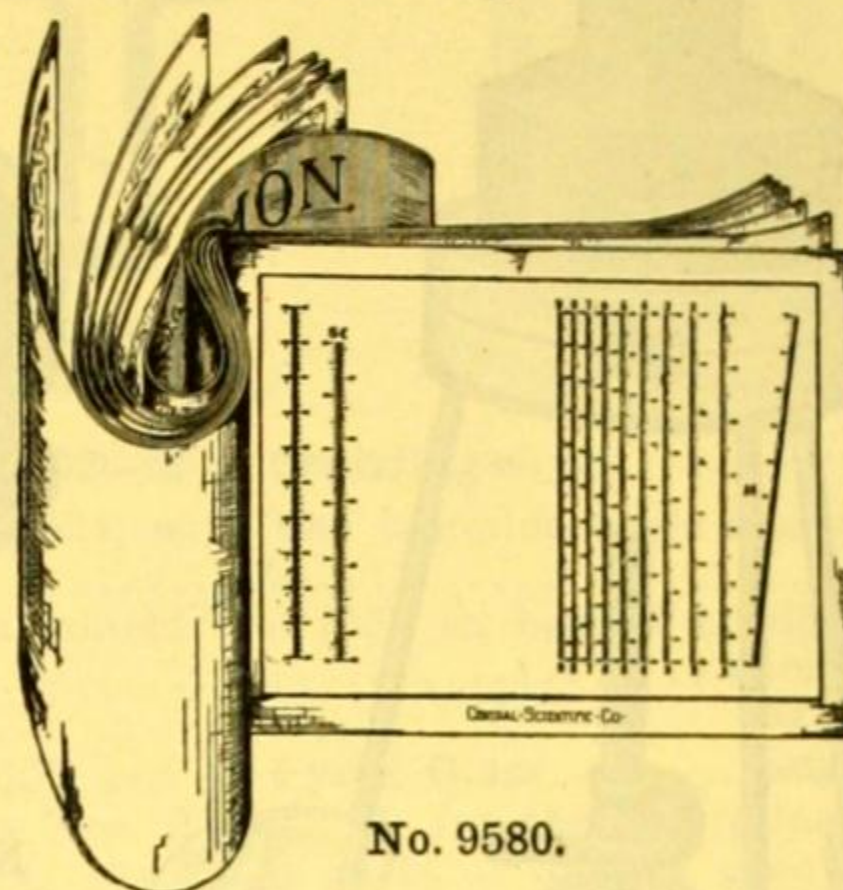
9533. **Compensating Tube** only, with open tube for sealing when standardized..... 1.80
9534. **Generating Bulb** only, holding about 300 cc, with two stop-cocks and reservoir..... 6.00
9535. **Measuring Tube** only, graduated from 10 to 14 per cent. in 0.01 division..... 5.00
9536. **Mercury Leveling Bulbs** only..... each .75
9537. **Three-Way Tube** only, for connecting compensating tube to measuring tubes and leveling bulb.60
9538. **Universal Tube** only, graduated from 0 to 100 per cent. in $\frac{1}{10}$ divisions..... 7.50
9546. **NITROMETERS**, Lunge's, with three-way stop-cock and plain leveling tube.
 Graduated to, cc..... 50 in $\frac{1}{10}$
 Each 4.50
9550. **NITROMETERS**, Lunge's, same as No. 9546, but provided with special three-way stop-cock.
 With plain leveling tube.
 Graduated to, cc..... 50 in $\frac{1}{10}$
 Each 5.00
9556. **NITROMETER**, Schiff's, graduated to 100 cc in $\frac{1}{5}$ cc divisions; on support with reservoir, clamp and connections 10.00



No. 9560.

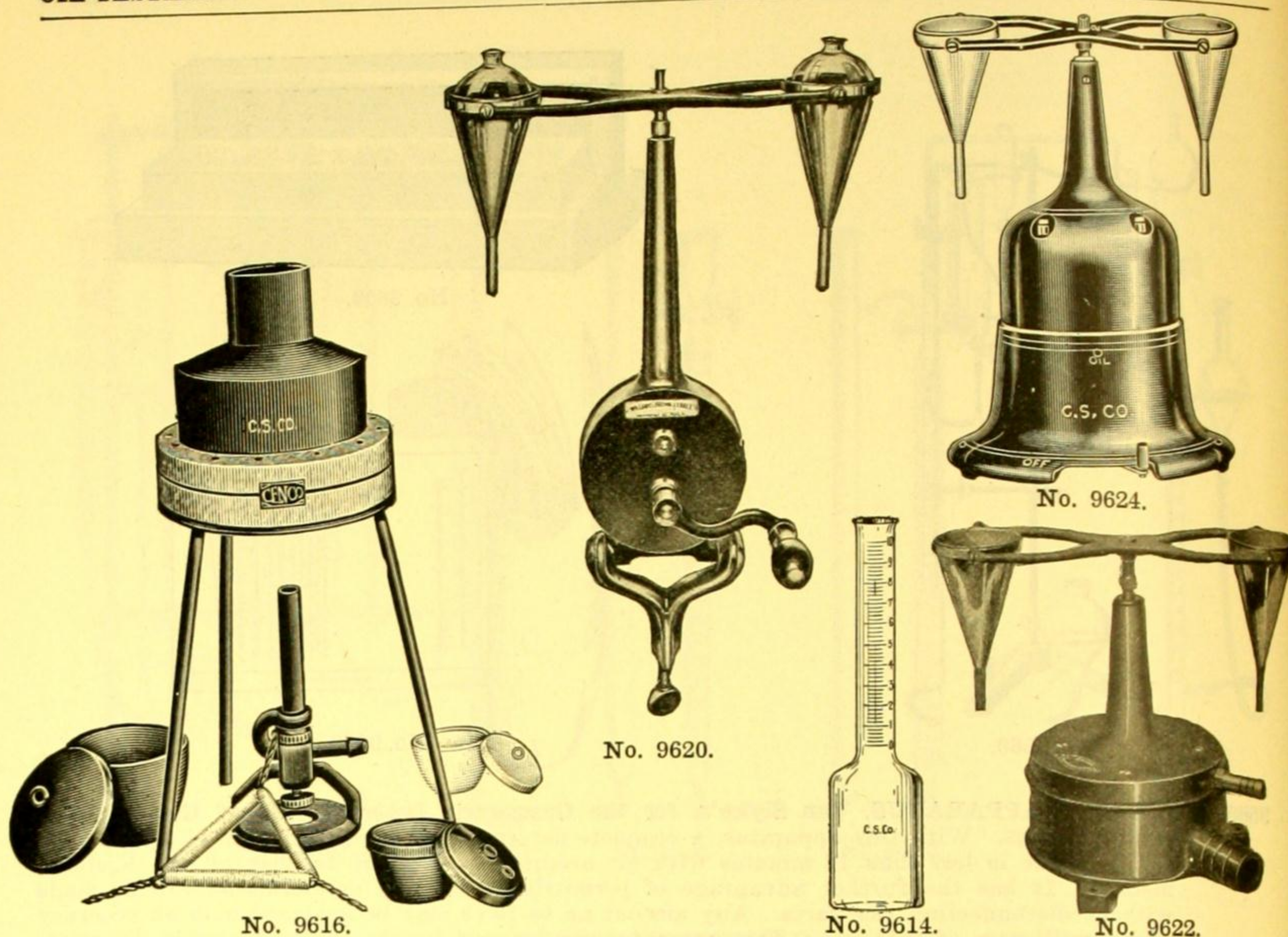


No. 9609.



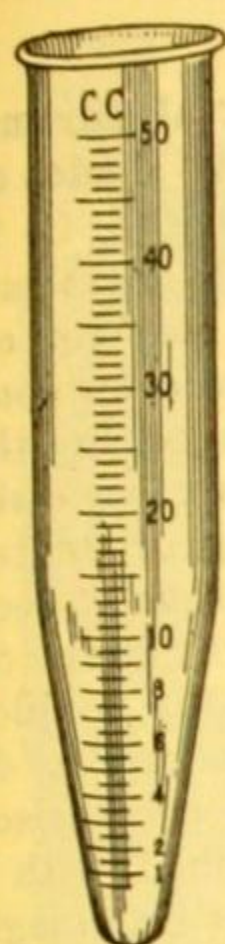
No. 9580.

9560. **NITROGEN APPARATUS, Van Slyke's**, for the Gasometric Determination of the Aliphatic Amino Groups. With this apparatus, a complete determination of the nitrogen in amino acids can be made in less than 10 minutes with an accuracy equivalent to that of the Kjeldahl method. It has the further advantage of permitting successive determinations to be made without disconnecting the parts. Any amount up to 10 cc may be analyzed with an accuracy of $\frac{1}{20}$ milligram of nitrogen. This apparatus can be used for the study of protein digestion, both in vitro and in vivo; the determination of the nature of the amino acids yielded by hydrolysis of small amounts of protein; determination of free amino groups in fixing the constitution of various organic substances, and the determination of amino acid nitrogen in urine, blood and tissues. Complete with glass parts and supports, pulley, shaking device and connections, but without electric motor. (See Journal of Biological Chemistry, Vol. XII, page 275, for 1911 and Vol. XVI, page 121 for 1913.) \$55.00
9561. Glass Parts only of No. 9560..... 35.00
9562. Deaminizing Vessel only of No. 9560. Graduated to 10 cc in $\frac{1}{10}$ cc divisions..... 24.00
9563. Gas Burette only of No. 9560, with three-way stop-cock, leveling bulb and connecting tubing. Graduated to 40 cc in $\frac{1}{10}$ cc divisions..... 9.00
9564. Gas Pipette only of No. 9560, for shaking..... 4.00
9566. **NITROGEN APPARATUS, Van Slyke's**, similar to No. 9560, but smaller in size, so-called Micro size. Complete with supports, pulley, shaking wheel, and connections, but without motor 55.00
9567. Glass Parts only of No. 9566..... 35.00
9568. Deaminizing Vessel only of No. 9566. Graduated to 2 cc in $\frac{1}{10}$ cc divisions..... 24.00
9569. Gas Burette only of No. 9566. Graduated to 3 cc in $\frac{1}{100}$ cc divisions..... 9.00
9570. Gas Pipette only of No. 9566..... 4.00
- Motors, Variable Speed, for use with Nos. 9560 and 9566. 27.00
2361. For 110 volts 27.00
2362. For 220 volts 27.00
9580. **NOMON, a Calculating Chart, Chemists' Edition**, designed by Horace G. Deming of the University of Illinois. This device consists of a set of 18 sections bound together in book form, each section containing 13 engine divided scales, with about 40,000 separate points or subdivisions. By means of the Nomon, the mathematical operations of multiplication, division, raising to powers, extracting roots and determination of reciprocals can be performed rapidly and with an accuracy five times as great as with an ordinary slide rule. In addition practically all the special mathematical operations peculiar to chemistry and chemical engineering can be performed easily and accurately. Complete with book of scales, five place table of logarithms, and a manual of instructions containing tables of chemical data and factors conveniently arranged for use..... 1.60
9600. **OIL CAN**, zinc, diameter 2 inches, 22 cc capacity25
9601. **OIL CAN**, same as No. 9600, filled with fine sperm oil75
- OIL SAMPLE BOTTLES**, see general heading **Bottles**..... .90
9608. **OIL STONE**, Washita, genuine, 5-inch, unmounted90
9609. **OIL STONE**, Washita, Mounted, same as No. 9608, mounted in case..... .90

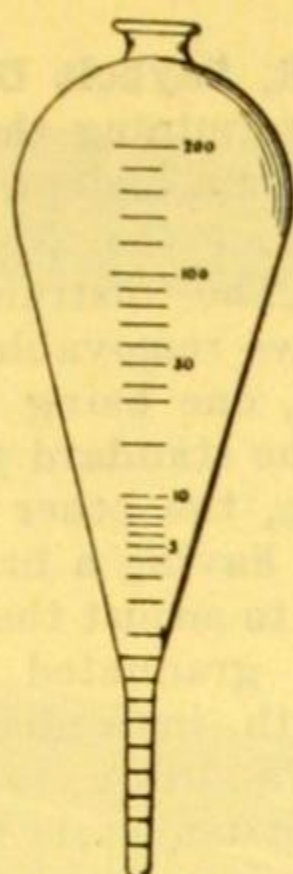


OIL TESTING APPARATUS

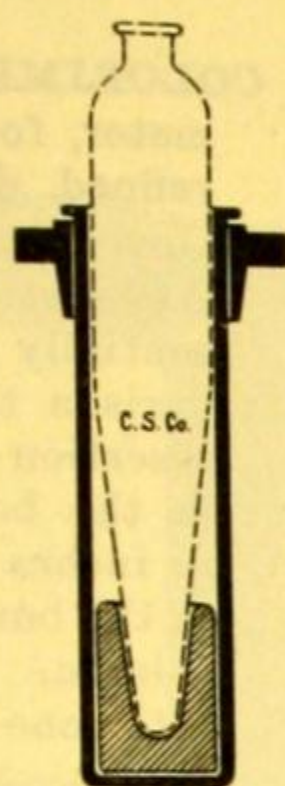
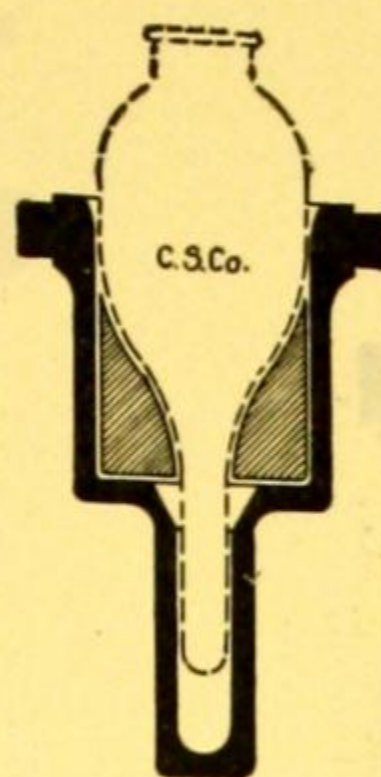
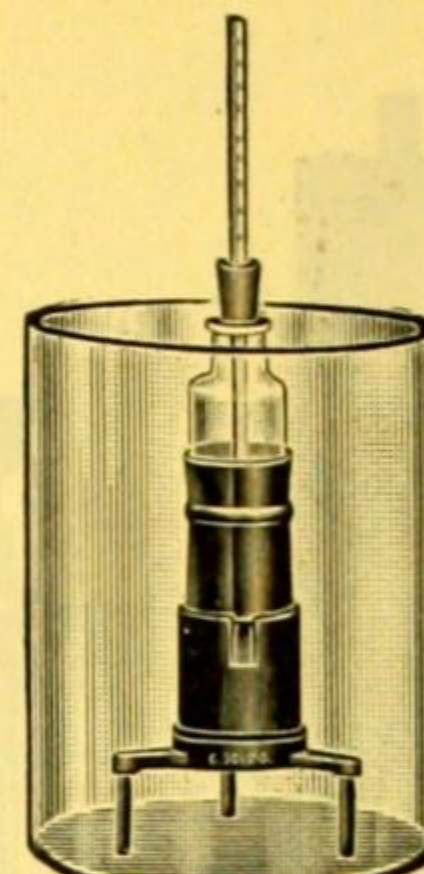
9614. **BABCOCK FLASK**, for Unsaturated Hydrocarbon Test of Gasolines, consisting of a modified Babcock bottle with neck calibrated from 0 to 100 for direct reading in percentage. Capacity of graduated portion of neck, 10 cc; height over all, 6½ inches. (See Specifications given in Technical Paper No. 298 of the U. S. Bureau of Mines.) \$0.75
- CALORIMETERS** for determination of heat units in Oil, see general heading **Calorimeters**.
9616. **CARBON RESIDUE APPARATUS**, Conradson, for determining the carbon residue in petroleum oils and bituminous materials, adopted as the standard apparatus for this determination by the American Society for Testing Materials. The apparatus consists essentially of a heavy base of asbestos slate with beveled opening and an annular groove in which fits a Russia iron chimney; a large wrought iron crucible supported from below by a tripod and pipe-stem triangle, is placed in the opening in the asbestos slate and contains a Skidmore crucible, in which, in turn, is placed the porcelain crucible intended for the sample. (See Standard Methods for 1921, D47-21 of the American Society for Testing Materials.) Complete as illustrated with iron tripod, pipe-stem triangle, asbestos slate base, chimney, two iron crucibles, one porcelain crucible, and gas burner. 9.00
9620. **CENTRIFUGE, Hand Driven**, for two 100 cc B. S. oil tubes. The machine will whirl two 100 cc tubes filled with liquid at 1500 revolutions per minute. The strong iron horseshoe clamp with thumb-screw permits rigid fastening of the centrifuge to the edge of the table so that the machine operates with a minimum of vibration. Complete with two-tube arm with conical shields, and with two graduated glass tubes No. 9631, reading directly in percentage of B. S. 25.00
9622. **CENTRIFUGE, Water Motor**, similar in construction to No. 9620, but operated by a ball-bearing water motor. The shaft is suspended on hardened steel ball-bearings in such a way that the water cannot come in contact with the bearing surfaces. In this way all danger of rust or clogging is avoided. Complete with 3 feet of pressure tubing, hose connection for ordinary smooth faucet, two-tube B. S. arm, and two graduated glass tubes No. 9631, reading directly in percentage of B. S. 25.00
9624. **CENTRIFUGE, Electric**, mounted on heavy enameled cast iron base, enclosing the motor. The shaft is accurately centered, preventing vibration. A rheostat in the base provides for three different speeds. Complete with two-tube arm with conical shields, two graduated glass tubes No. 9631 reading directly in percentage of B. S., attachment cord and plug.
- | No. | A | B | C | D |
|-----------|---------|---------|---------|---------|
| For volts | 110A.C. | 220A.C. | 110D.C. | 220D.C. |
| Each | 60.00 | 68.00 | 60.00 | 68.00 |



No. 2556.



No. 9631.

No. 2714.
No. 2715.
No. 2717.No. 9633.
No. 2737.

No. 9636.

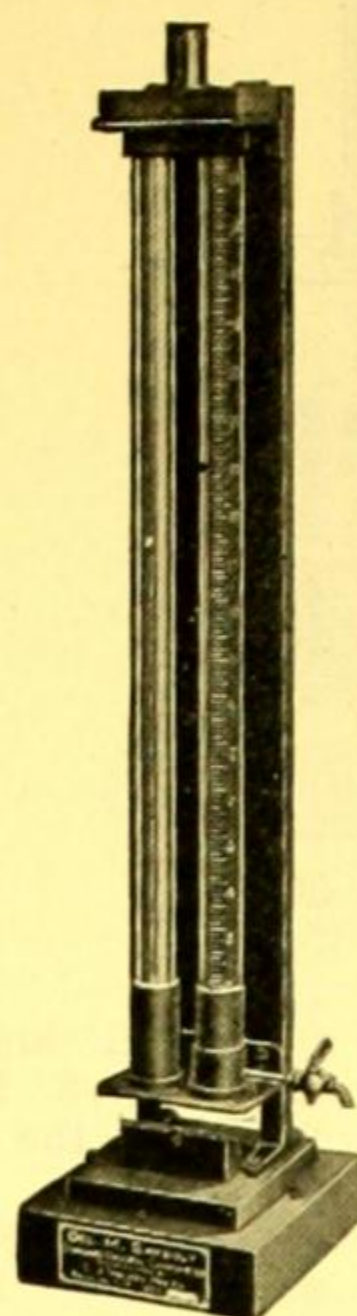
Parts and Accessories for No. 9620-22-24 Centrifuges.

9629. Head, Two Place, for centrifuges Nos. 9620 to 9624, with two trunnion rings and metal shields for 50 cc glass tubes No. 2556.....\$ 8.30
2556. Glass Tubes, Graduated, 50 cc, for use in metal shield No. 2558 on head No. 9629, for the examination of kerosene..... each, .60
per dozen, 6.50
- 2556A. Glass Tubes, Graduated, 50 cc, same as No. 2556, but of Pyrex Glass.....each, 1.50
9631. Glass Tube, Graduated, for use with centrifuges Nos. 9620-22-24, for the determination of B. S. in oils. Capacity 100 cc, graduated in 200 parts. As equal parts of oil and gasoline or benzol are mixed in making this test, this graduation enables the B. S. to be read directly in percentage. By means of the narrow tip, amounts as small as 1/10 of one percent can be measured 1.40
9633. Glass Oil Tube, Graduated, 100 cc, for use with centrifuges Nos. 9620-22-24 and in trunnion carrier No. 2737 for use with International Centrifuge. Graduated in 1/10 cc divisions to 3 cc, in 1/2 cc divisions to 5 cc, in 1 cc divisions to 10 cc, in 5 cc divisions to 25 cc, and in 50 cc divisions to 100 cc. (See Tentative Specifications of the American Society for Testing Materials for 1921, No. D96-21T)..... 1.30
2737. Trunnion Carrier, for glass oil tube No. 9633, for use in head No. 2684..... 3.00
2558. Metal Shields, for use with heads Nos. 9629 and 9630, for holding kerosene tubes No. 2556. each, .35

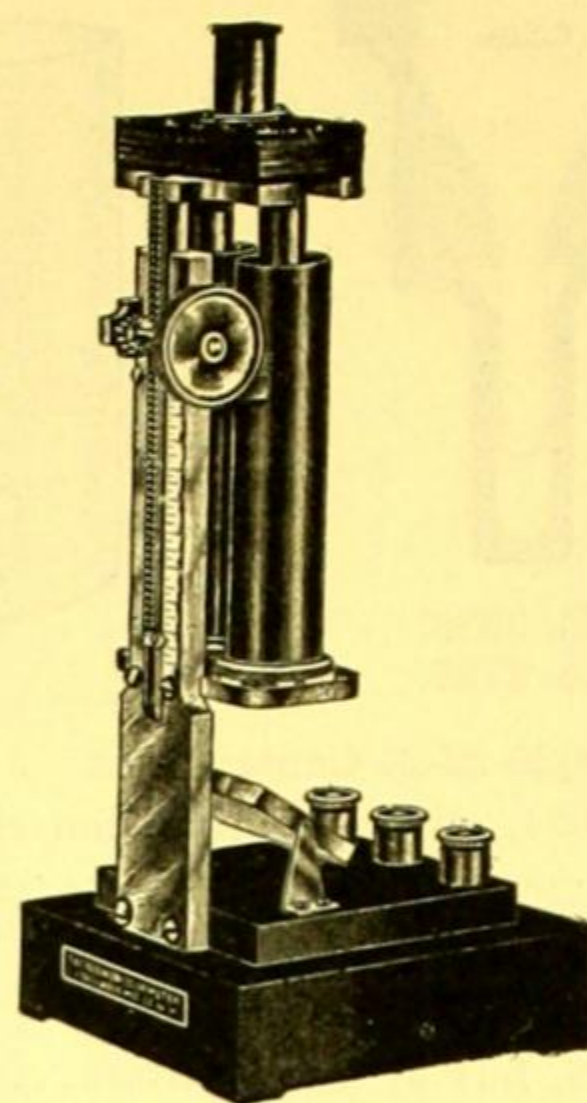
Oil Accessories for International Centrifuges.

(For International Centrifuges see general heading Centrifuges.)

2681. Head, Four Place, for 50 cc trunnion rings No. 2732, and with trunnion ring No. 2715 for International Centrifuge No. 2..... 9.00
2684. Head, Two Place, for trunnion carrier No. 2737 for oil percentage tubes..... 4.50
2714. Metal Shield, for 100 cc tapered glass oil tubes. For use with No. 2715 trunnion rings on head No. 2681 in size No. 2 Centrifuge only. With rubber cushion..... 1.75
2715. Trunnion Rings, for metal shield No. 2714, for use with head No. 2681 on size No. 2 centrifuge only55
2717. Glass Oil Tubes, Graduated, 100 cc, with tapered bottom and narrow neck. Graduated in 1/20 cc divisions to 1 cc, in 1/10 cc to 6 cc, in 1/2 cc to 10 cc, and in 1 cc to 100 cc. For use in No. 2714 metal shield. (See Tentative Specifications of the American Society for Testing Materials for 1921, No. D96-21T)..... each, 1.50
each, 2.50
- 2717A. Glass Oil Tubes, Graduated, 100 cc, same as No. 2717, but of Pyrex..... each, 2.50
2730. Metal Shield, for 50 cc glass tubes No. 2746, on trunnion ring No. 2732. With rubber cushion..... .85
..... .50
2732. Trunnion Ring, for 50 cc metal shield No. 2730..... With
2737. Trunnion Carrier, for oil percentage tubes No. 2749A, for use with head No. 2684. With rubber cushion 3.00
2746. Glass Tubes, Graduated, 50 cc, with short tapered bottoms and pour out. Graduated in 1/2 cc divisions to 10 cc and 1 cc divisions to 50 cc. For use in No. 2730 metal shield. each, .60
per dozen, 6.48
each, 1.40
- 2746A. Glass Tubes, Graduated, 50 cc, same as No. 2746, but of Pyrex..... each, 1.40
9636. COLD TEST APPARATUS, for Determining the Cloud and Pour Points of Petroleum Products, according to the requirements of the American Society for Testing Materials. Consists of a standard 4-oz. sample bottle provided with cork ring gasket; a metal jacket with cork disk for protecting bottom of sample bottle and for promoting uniform cooling; a metal frame with tripod for supporting the test bottle and jacket; a glass container for the freezing mixture; and a standard cold test thermometer graduated from -36° to 120° F. in 2° divisions. Complete as described. (See A. S. T. M. Tentative Specifications for 1921, No. D97-21T)... 9.00
13612. THERMOMETER only for above, solid stem, graduated from -36° to 120° F. in 2° divisions, sealed for 4 1/4 inch immersion..... 3.00



No. 3093.



No. 3097.

3093. **COLORIMETER, Saybolt Universal Chromometer**, for determining the color shades of refined petroleum, adopted by the U. S. Government and the National Petroleum Association. The instrument consists essentially of two removable glass color comparison tubes, one being arranged for the insertion of the standard yellow glass disks in the bottom, the other being graduated in inches and having a brass draw-off cock in the bottom to adjust the height of the oil column. The graduated tube is divided into one-eighth inch divisions up to 20 inches. In addition to the comparison tubes, the instrument is furnished with a prismatic eye-piece which brings into single eye-vision a field with one-half illuminated by light reflected through the plain tube containing the yellow glass standard, and the other half illuminated by light reflected through the column of oil under examination in the graduated tube. Two color glasses are provided with the instrument, both glasses used together to determine color shades up to and including the arbitrary value +15, and only one glass from

+16 to +25. To make the comparison, oil is placed in the graduated tube and the color glass inserted at the lower end of the plain tube. The oil is now withdrawn from the graduated tube until the color observed through the eye-piece agrees with that of the standard glass. The color is then expressed by the height of the oil column in scale divisions, $4\frac{4}{8}$ inches of oil in the tube, using two color slides, being equivalent to zero color shade, or "standard white," and 12 inches of oil, using one color slide, being equivalent to +21 color shade, or "water white." The color values for the intermediate readings on the graduated tube may be obtained from the table provided with the instrument. (See Technical Paper No. 298 of the U. S. Bureau of Mines.) Complete with two standard glasses, color table and direction card, in wooden carrying case \$80.00

3093A. **STANDARD COLOR GLASSES**, for No. 3093..... each, 15.00

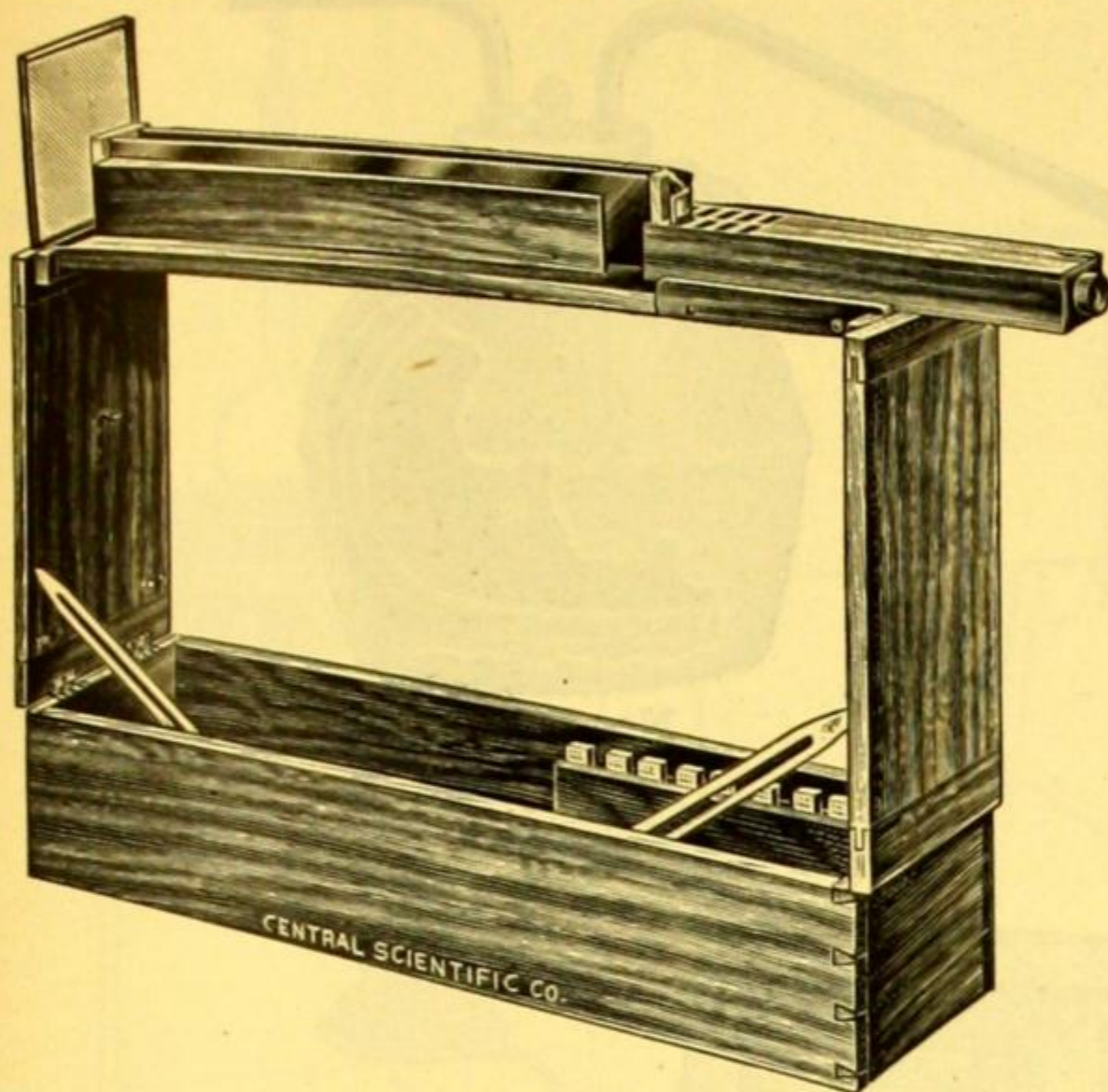
3097. **COLORIMETER, Tag-Robinson**, for determining the color-shades of lubricating oils. This instrument is of the same general type as the Saybolt Universal Chromometer, except that, inasmuch as the depth of the oil under test need not be varied through as great a distance, the variation is accomplished by an immersion tube, which can be raised and lowered by means of a rack-and-pinion device. Readings are made on a scale in the face of the instrument opposite the index, and indicates the depth of oil necessary to match the color shade of the standard color glass which screws into the color standard plunger. Three standard color glasses are provided, one yellow (No. 3), for light oils; one amber (No. 2), for medium colored oils; and one red (No. 1), for dark oils. With these the complete range of color-shades for lubricating oils is secured, including all the National Petroleum Association Standards. Complete as described, with three standard color glasses mounted to screw into the color-standard plunger, color table and direction card, in wooden carrying case 100.00

3097A. **STANDARD COLOR GLASSES**, mounted to screw into color-standard plunger of No. 3097.

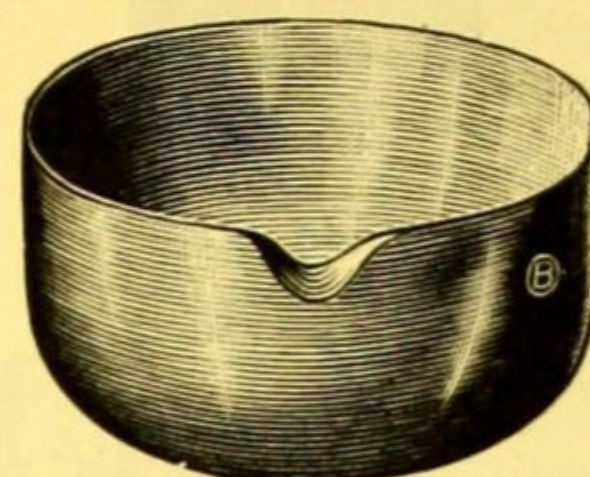
No.	1	2	3
Each	12.50	12.50	12.50

Table of National Petroleum Association Standards in Terms of Tag-Robinson Colorimeter Colors.

N. P. A. No.	Slide No.	Color	Tag-Robinson Colors
1.0	G	Lily White	20.50 Yellow
1.5	H	Cream White	17.50 Yellow
2.0	I	Extra Pale	12.25 Amber
2.5	J	Lemon Extra Pale	10.25 Amber
3.0	K	Lemon Pale	9.50 Amber
3.5	L	Orange Extra Pale	9.25 Amber
4.0	M	Orange Pale	8.50 Red
4.5	N	Pale	5.24 Red
5	O	Light Red	3.75 Red
6	P	Dark Red	2.75 Red
Q	Q	Claret Red	2.25 Red



No. 3107.



No. 3829.

3107. **COLORIMETER, Lovibond Tintometer, for Standardizing Merchantable Petroleum.** This set has been the standard of petroleum refineries for many years for gasoline, kerosene, naphtha and other burning oils, as it offers a very simple means of grading these products. Consists of one monocular observation instrument; one 18 inch silvered metal cell with glass ends; one reflector; four special standard glasses for water white, standard white, superfine white and prime white oils and a hardwood case constructed to open up in the form of a stand, which, when placed on a table of ordinary height, will bring the eye-piece of the observation instrument in a line with the eye. Complete as described \$72.00
3108. **COLORIMETER, Lovibond Tintometer, for Merchantable Petroleum, Intermediate, Russian and Lubricating Oils,** same as above but with the addition of one 1/16 inch silvered metal cell and five additional standard glasses, 1.5, 3, 4, 5 and 7. Complete, in hardwood case..... 96.00
- 3105C. **COLOR GLASSES, Standard for Lovibond Tintometer,** furnished in three dominant colors of the spectrum, red, yellow and blue, for general work. For each of these colors there is a series of 155 shades of color, graduated from 0.01 to 20.0 tint units. There are 465 color glasses in all in these three shades. The tint units are derived from the wave length values of the diffraction spectrum which lie between A 760400 and H 396319. This range is divided into 100 parts which are the tint units. Each tint unit therefore covers a range of 3640 wave lengths. For colorimetric testing of specific substances, arbitrary color ranges have been chosen which are not pure color tints. These are merely known as color glasses of a numbered series, as, for example, the "50 Brown," "52 Brown," "200 Red," "510 Yellow," "1180 Blue," the "500" amber series for refined oils, etc.

To reproduce the **National Petroleum Association Standards**, Lovibond color glasses must be used as follows:

N. P. A. No.....	2.0	3.5	4.0	4.5	5.0	6.0
Lovibond Glasses.. { 200 Red Series	6.90	7.80	14.00	21.00	35.00	60.00
510 Yellow Series	32.00	39.00	50.00	35.00	93.00	60.00
1180 Blue Series .....	.....	.....	0.55	0.55	.....	0.55

For determining color of refined products such as gasoline, naphtha and kerosene, Lovibond color glasses are used as follows: Water white, 2.3 of series "510 Yellow," 1.6 of series "200 Red" and 0.1 to 12.0 of series "500 Amber."

COLOR GLASSES, single, as described.....each, 2.00

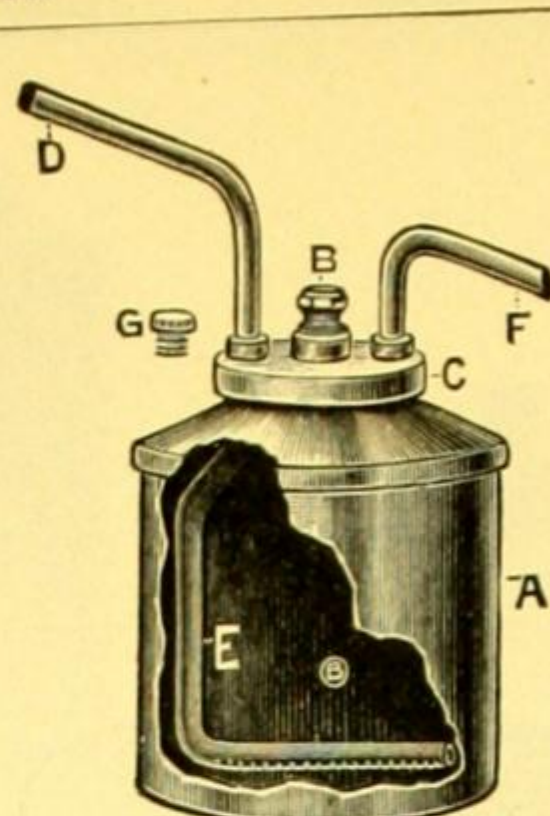
Note.—In ordering, specify color series and number.

- 3105E. **METAL CELLS,** silver plated, accurately gauged, with parallel plate glass ends to hold liquids whose color is to be matched with Lovibond color glasses.

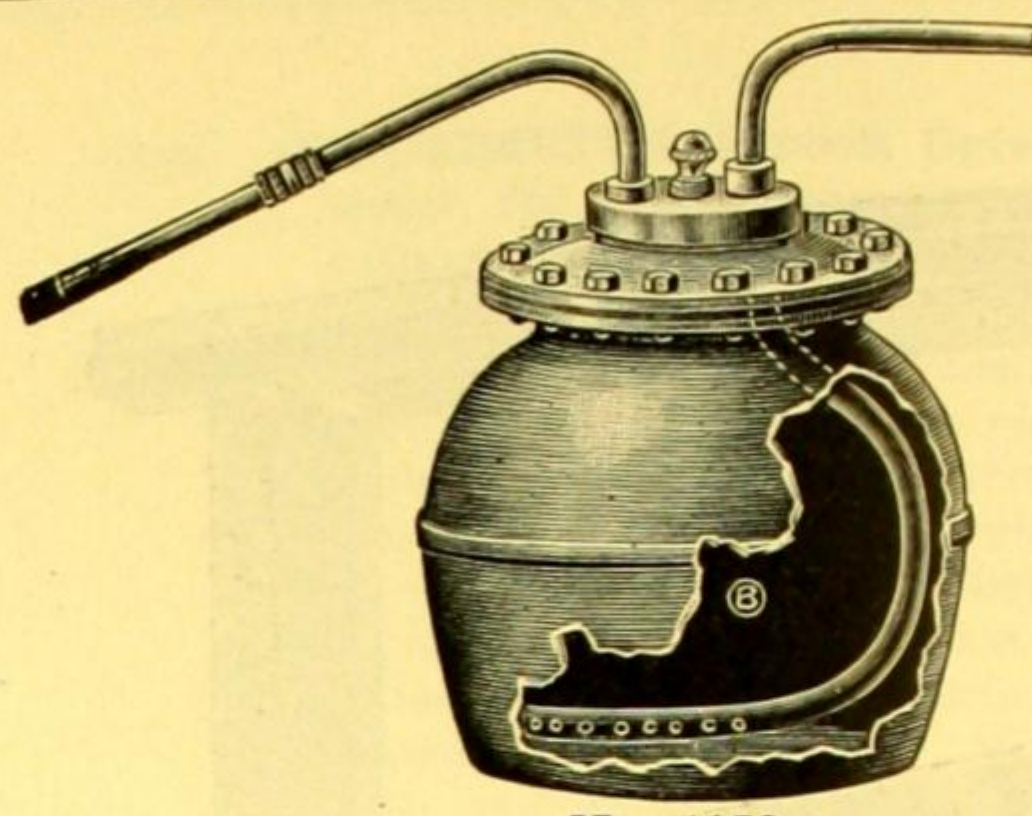
Length, inches	1/16	1	6	18
Each	7.20	8.00	12.00	18.00

3829. **CORROSION TEST DISH,** for the detection of free sulphur and corrosive sulphur compounds in petroleum products, consisting of a hemispherical dish of spun copper 3 1/2 inches in diameter, which can be polished for the test. (See Technical Paper No. 298 of the U. S. Bureau of Mines.) **Unpolished** 1.10

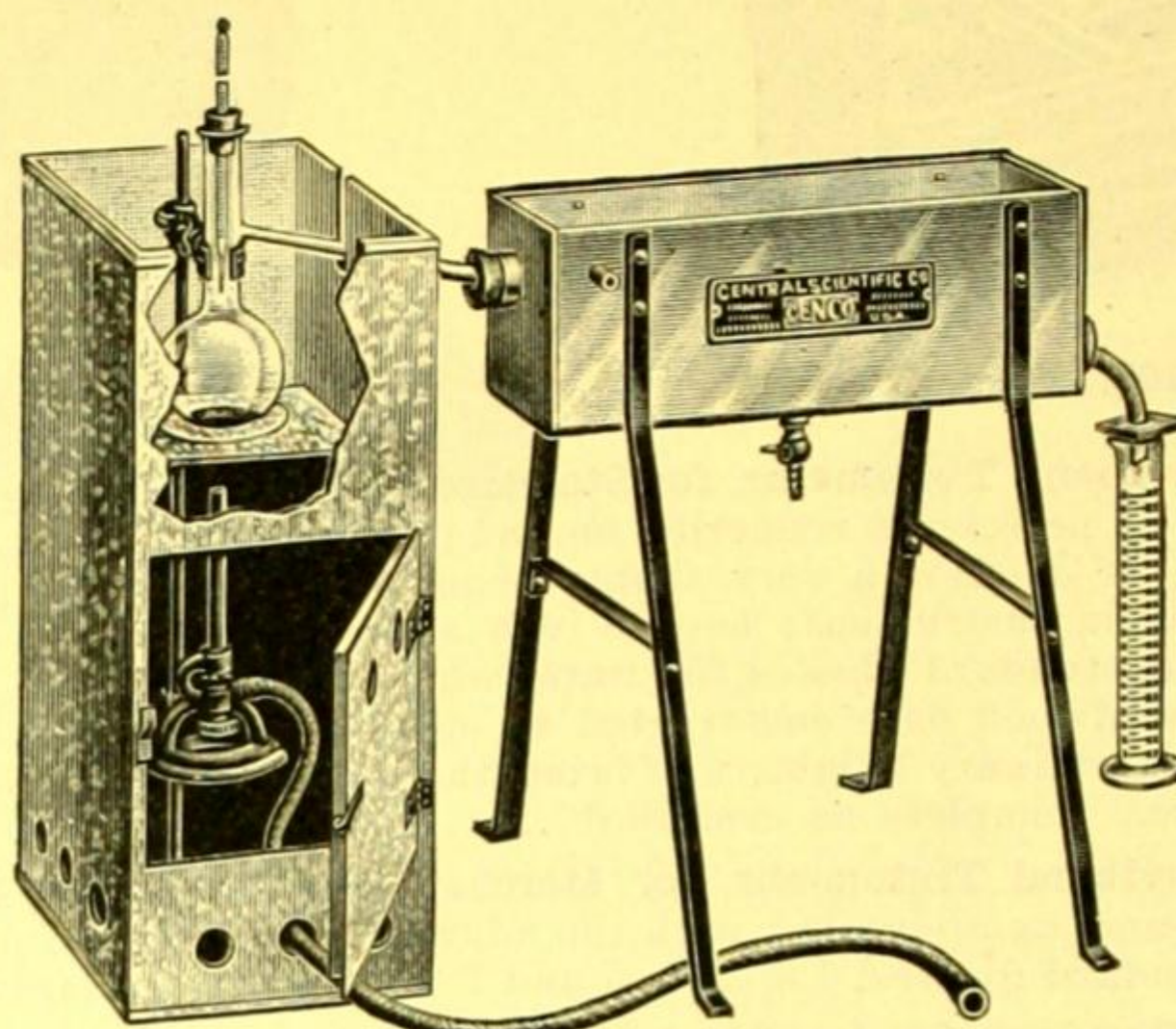
- F3360. **CORROSION TEST STRIPS,** for the detection of free sulphur and corrosive sulphur compounds in petroleum products, consisting of a copper strip 5 inches long by 3/4 of an inch wide, which can be polished for the test. (See American Society for Testing Materials Tentative Specifications for 1921, Serial No. D89-21T.) **Unpolished**.....each, .05



No. 4152.



No. 4153.

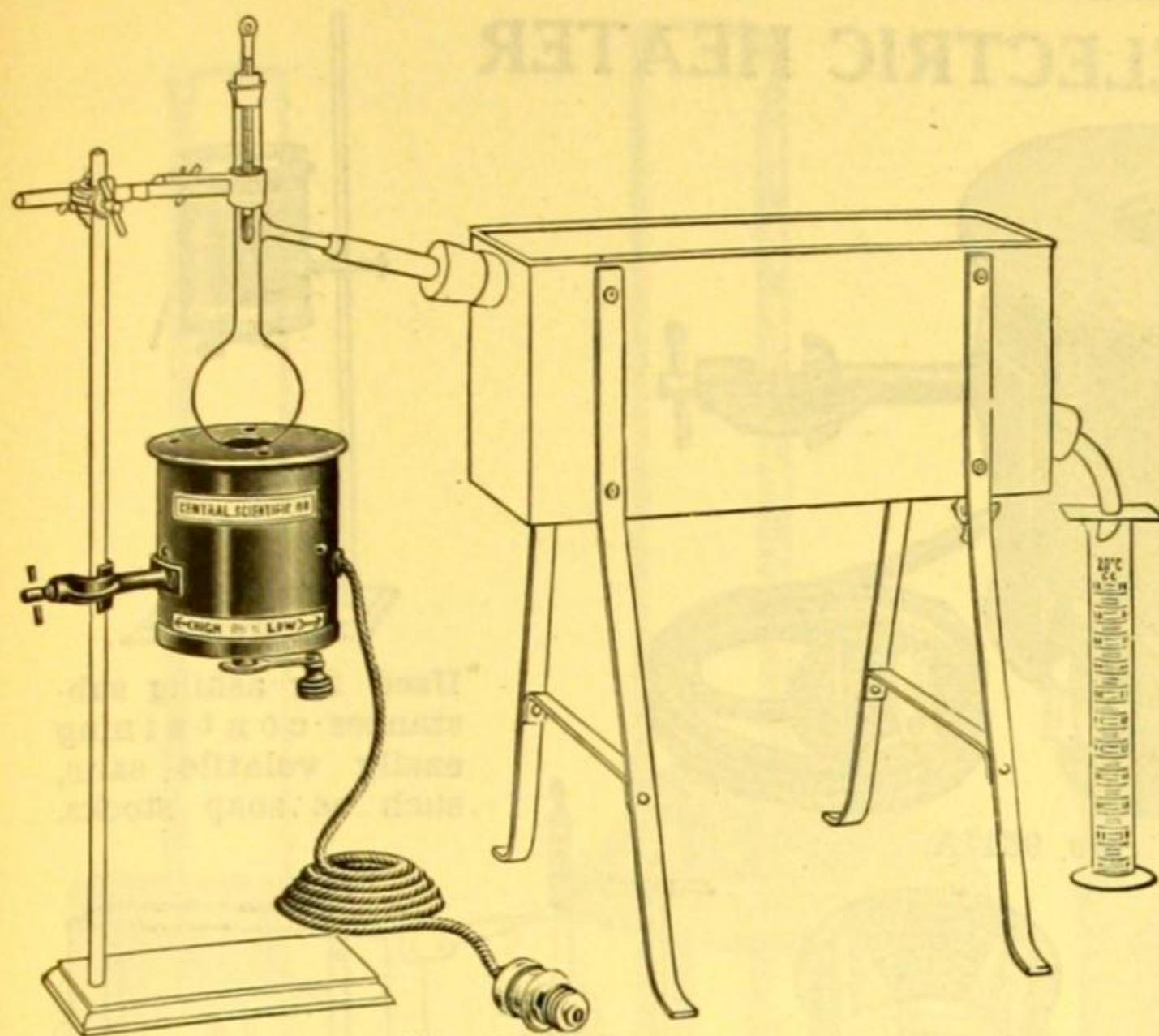


No. 9640.

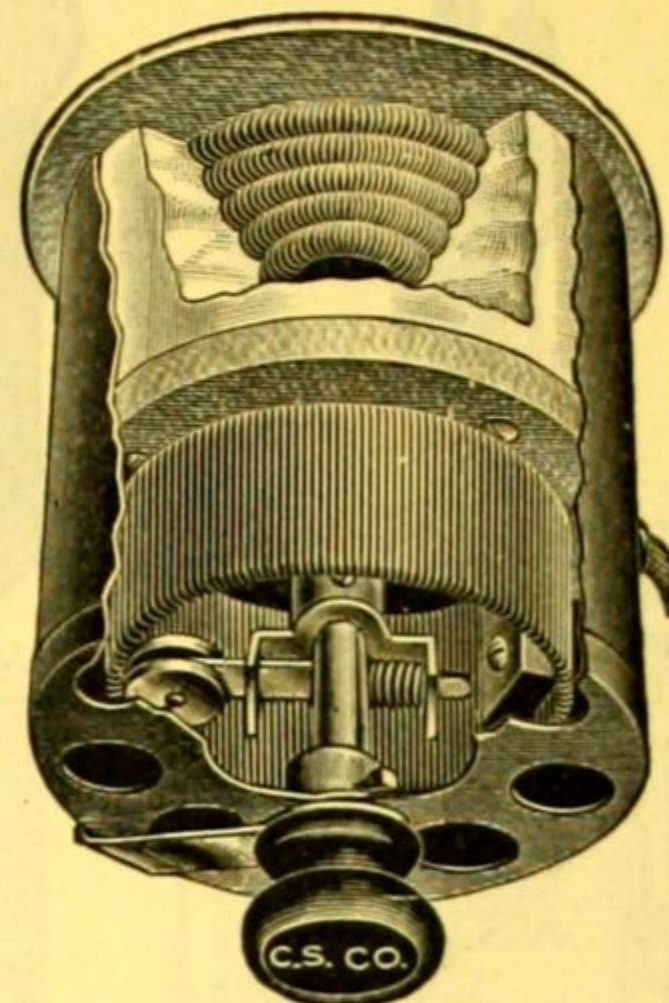
4152. **DISTILLING APPARATUS**, for the destructive distillation of heavy oils and other liquids or solids requiring requiring a high heat. The distillation may be made by live steam or by direct heat, with or without agitation by hot air blown through as desired. The still is of heavy copper with brass fittings. Capacity, $\frac{1}{2}$ gallon..... \$20.00
4153. **DISTILLING APPARATUS**, similar to No. 4152, but larger and heavier, with cover bolted on and jointed delivery tube.
- | | | |
|-------------------------|-------|-------|
| No. | A | B |
| Capacity, gallons | 1 | 2 |
| Each | 30.00 | 46.75 |
9640. **DISTILLATION APPARATUS**, for determining the boiling and end points of gasoline, kerosene, naphtha, other petroleum oils and paint thinners, according to the design of Committee D-2 of the American Society for Testing Materials, and recommended as standard for the testing of motor gasoline by the United States Bureau of Mines. The apparatus is also recommended for the testing of turpentine by Committee D-1 of the American Society for Testing Materials under Serial No. D13-21T. The apparatus consists of a copper condenser trough with brass condenser tube and iron support; a burner guard of galvanized iron with a door on one side; a transite asbestos shield with special brass support clamp; a gas burner with regulating valve for both gas and air; 3 feet of rubber tubing to connect burner with gas supply; an iron support stand; a clamp for supporting the flask; an iron burner support with heavy screw for clamping on support stand; a standard Engler flask, 100 cc; two corks for same, with hole for thermometer; two transite asbestos boards, with circular openings $1\frac{1}{4}$ and $1\frac{1}{2}$ inches respectively; thermometer graduated to 270° C., according to the specifications of the Bureau of Mines; cork to connect Engler flask with condenser tube; graduated cylinder 100 cc capacity. Complete as illustrated with directions for use. (See Tentative Specifications of the American Society for Testing Materials for 1921, No. D86-21T for the distillation of petroleum products; Tentative Specifications of the A. S. T. M. for 1921, No. D13-21T, for turpentine; and Technical Paper No. 298 of the U. S. Bureau of Mines, for distillation of motor gasoline)..... 27.50
(For more complete description and directions for use of No. 9640, send for Bulletin No. 47.)

PARTS AND ACCESSORIES FOR NO. 9640.

2194. **Burner, Alcohol Lamp**, for use with No. 9640 when gas is not available. Burns with intensely hot blue sootless flame, using denatured alcohol. Burns 3 hours at one filling..... \$4.00
9641. **Condenser only** of No. 9640, made of polished copper with stop-cock for draining, with inner tube of brass 22 inches long and $\frac{1}{2}$ inch inside diameter, mounted on iron supports. Length of condenser, 15 inches; height over all, 17 inches 10.00



No. 9649.
Electric Heater in Use (With Shield Removed)



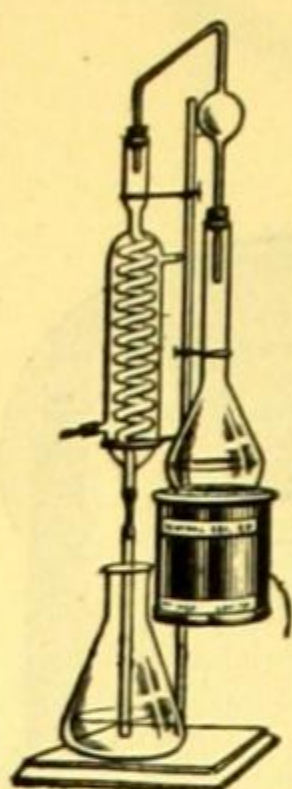
No. 9647.
Showing details of
construction

Parts and Accessories for No. 9640 (Continued).

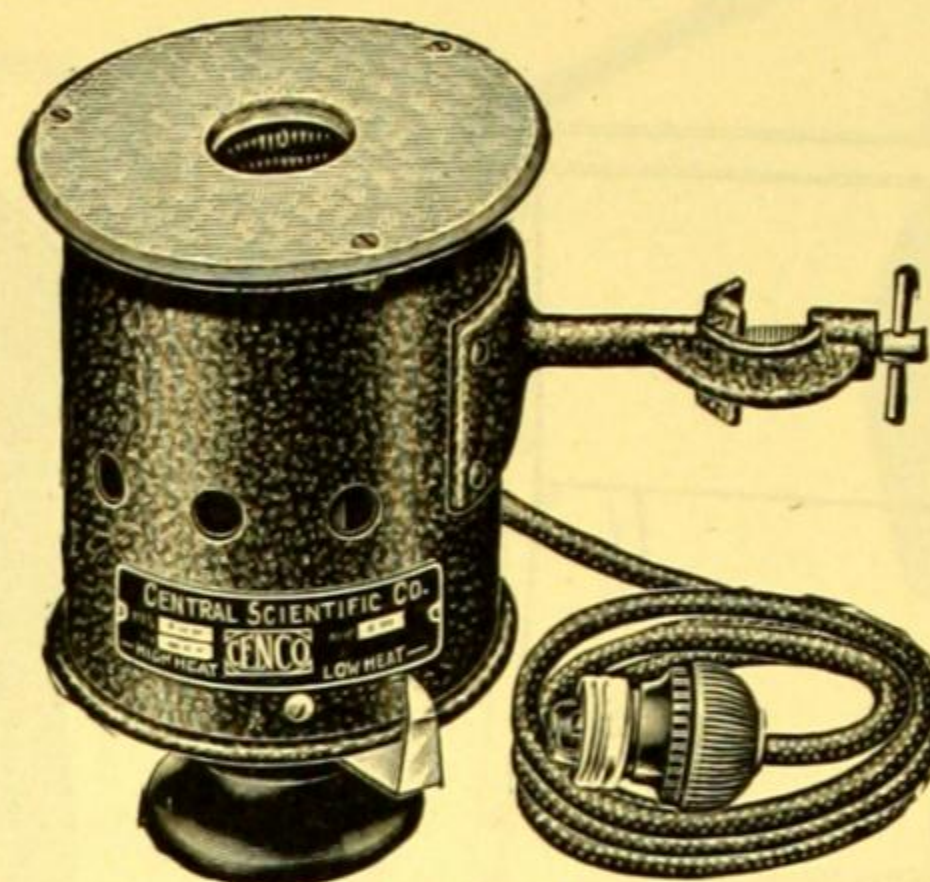
9642. **Corks**, specially selected for use in distilling flasks, sizes Nos. 6, 7, and 8 assorted, in bags of 100per bag, 1.40
Flasks, Distilling, Engler, see general heading **Flasks**.
Graduates, Cylindrical, see general heading **Cylinders**.
9644. **Burner Guard**, of galvanized iron, provided with a door on one side..... 7.50
 9644A. **Transite Shield**, cut to fit tightly inside of burner guard, constructed of $\frac{1}{4}$ inch transite with a circular opening 4 inches in diameter and provided with a special brass clamp for attaching to iron support stand..... 2.50
13622. **Thermometer for Distillation of Gasoline**, graduated to read from 0° to 270° C. in 1° divisions. Made according to specifications of the United States Bureau of Mines. Thermometers of other ranges or with Fahrenheit scale can be furnished shortly after receipt of order, if desired. (See Technical Paper No. 214, February, 1919.) 5.00
13624. **Thermometer, Solid Stem, Engraved Scale**, same as No. 13622, but graduated from 20° to 520° F., in 2° divisions..... 5.00
- Note.**—For A. S. T. M. and other distillation thermometers for use with No. 9640 Gasoline Distillation Apparatus, see Nos. 13626-9 and No. 13718 under general heading **Thermometers**.
9647. **HEATER, Cenco Electric**, with transite top containing a $1\frac{1}{4}$ inch opening for use with No. 9640 Gasoline Distillation Apparatus in place of the gas burner. For complete description see next page. No. A B
 For volts 110 220
 Each 15.00 16.00
9647. **HEATER, Cenco Electric**, same as Nos. 9647A and B, but with transite top with beveled opening $2\frac{1}{2}$ inches in diameter, for use with distilling flasks, Kjeldahl flasks, evaporating dishes, etc. No. C D
 For volts 110 220
 Each 16.00 17.00
- 9647E. **Transite Top**, only for Nos. 9647C and D, with beveled opening $2\frac{1}{2}$ inches in diameter.. .50
 9647F. **Transite Top**, only for Nos. 9647A and B, with circular opening $1\frac{1}{4}$ inches in diameter.. .50
 9647G. **Transite Top**, only for Nos. 9647A and B, with circular opening $1\frac{1}{2}$ inches in diameter, for use when distilling petroleum products* having an end point above 470° F., or turpentine .50
9648. **Heating Units**, for No. 9647 Cenco Electric Heater, for replacement. No. A B
 For Heater No. 9647..... A and C B and D
 Each 2.50 3.00
9649. **GASOLINE DISTILLATION APPARATUS**, same as No. 9640, but with No. 9647 Cenco Electric Heater instead of the gas burner. No. A B
 For volts 110 220
 Each 35.00 36.00

*Note.—Although the Cenco Electric Heater is not intended for kerosene since the wattage of the heater is not sufficient to maintain the required rate of distillation, yet it may be employed for this purpose if a conical asbestos shield is placed around the flask to conserve the heat.

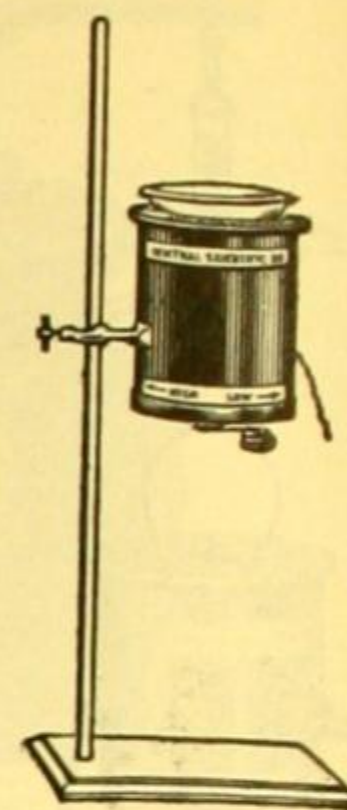
CENCO ELECTRIC HEATER



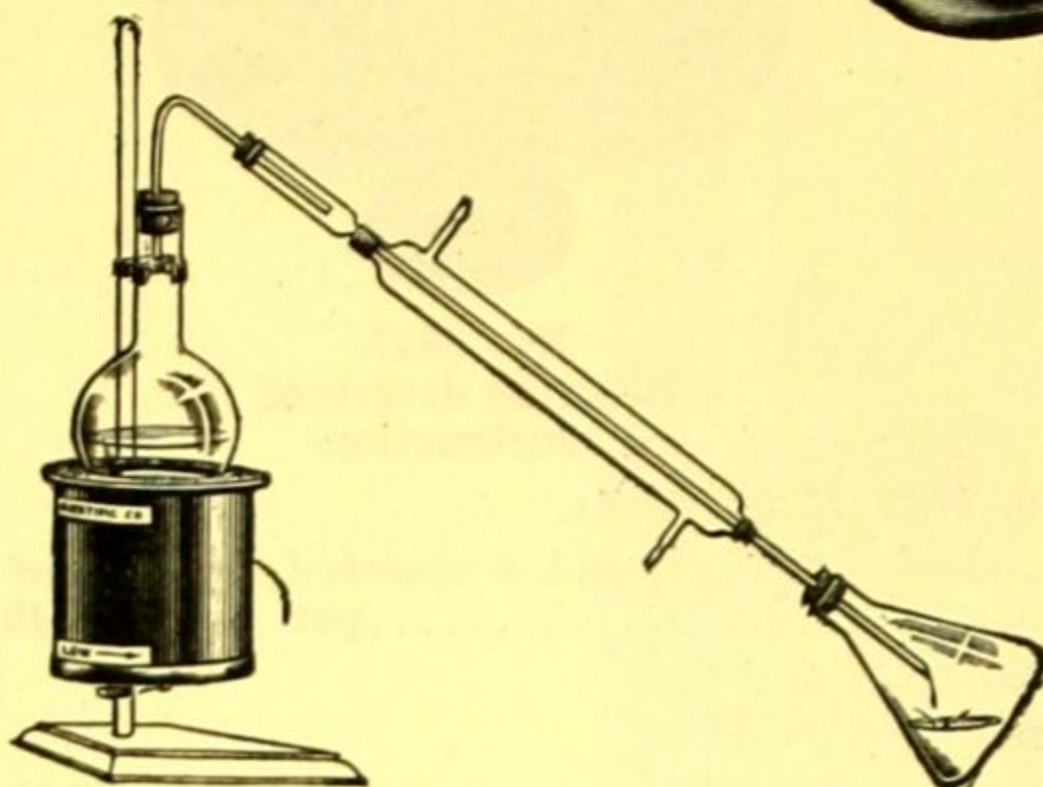
Used in nitrogen distillation in the Kjeldahl method.



No. 9647A.



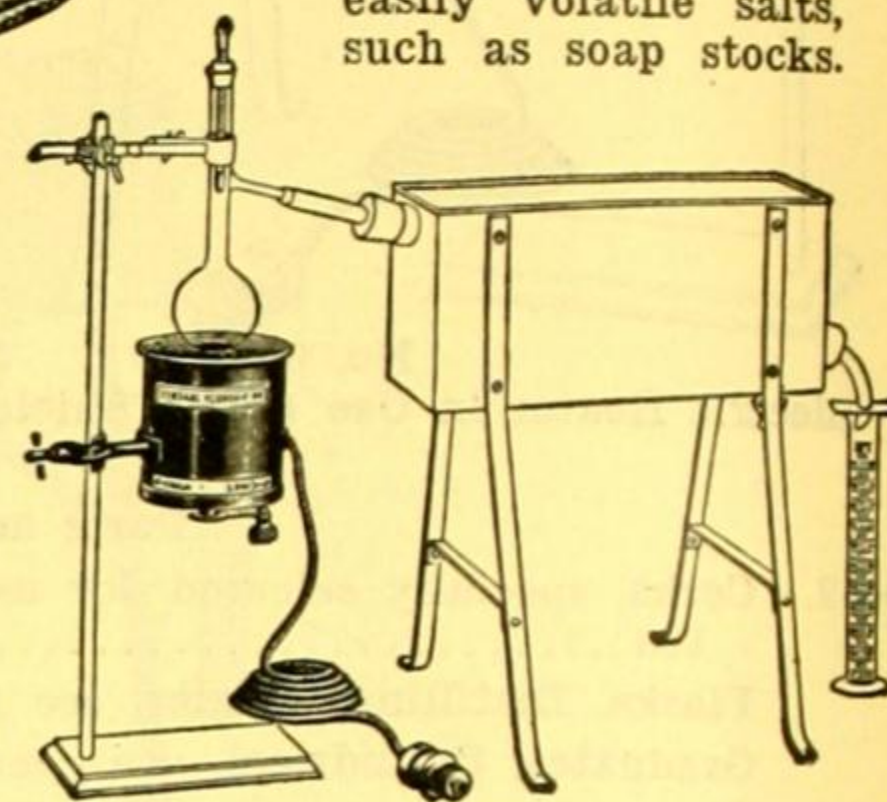
Used for ashing substances containing easily volatile salts, such as soap stocks.



Used in the distillation of inflammable liquids of high boiling point.



Showing details of construction



Used in determining boiling and end points in the distillation of gasoline.

9647. **HEATER, Cenco Electric**, originally designed according to suggestions from Dr. E. W. Dean, of the United States Bureau of Mines, for **Boiling and End Point Tests of Gasoline**. Its construction and method of temperature control have led to its use for a variety of purposes for which a concentrated, intense heat is required, free from fluctuations due to draughts and free from danger of explosion of inflammable materials.

The device is constructed according to a new idea in electric heaters. By a special process of construction, the heating coil of chromel wire is securely held in the form of a conical helix in the solid block of insulating material by means of a refractory cement. The separate turns of wire are in contact with the refractory cement for only a small part of their circumference, and as a result, the heat wasted by absorption in and radiation from the block is reduced to a minimum. The maximum exposure of wire surface, the conical shape of the depression in the block and the high heat radiating qualities of the cement combine to concentrate the heat upon the $1\frac{1}{4}$ inch opening in the transite top of the heater. Due to this method of construction the heater responds readily to changes in current produced by adjusting the rheostat, and facilitates regulation of the distillation at the specified rate. The flask containing the gasoline is subjected to an intense heat (sufficient to ignite paper immediately) without danger of breakage.

The coil of heating wire, together with the insulating block in which it is inserted, constitutes the **Heating Unit**, which can be easily replaced by the user in case of a burn-out.

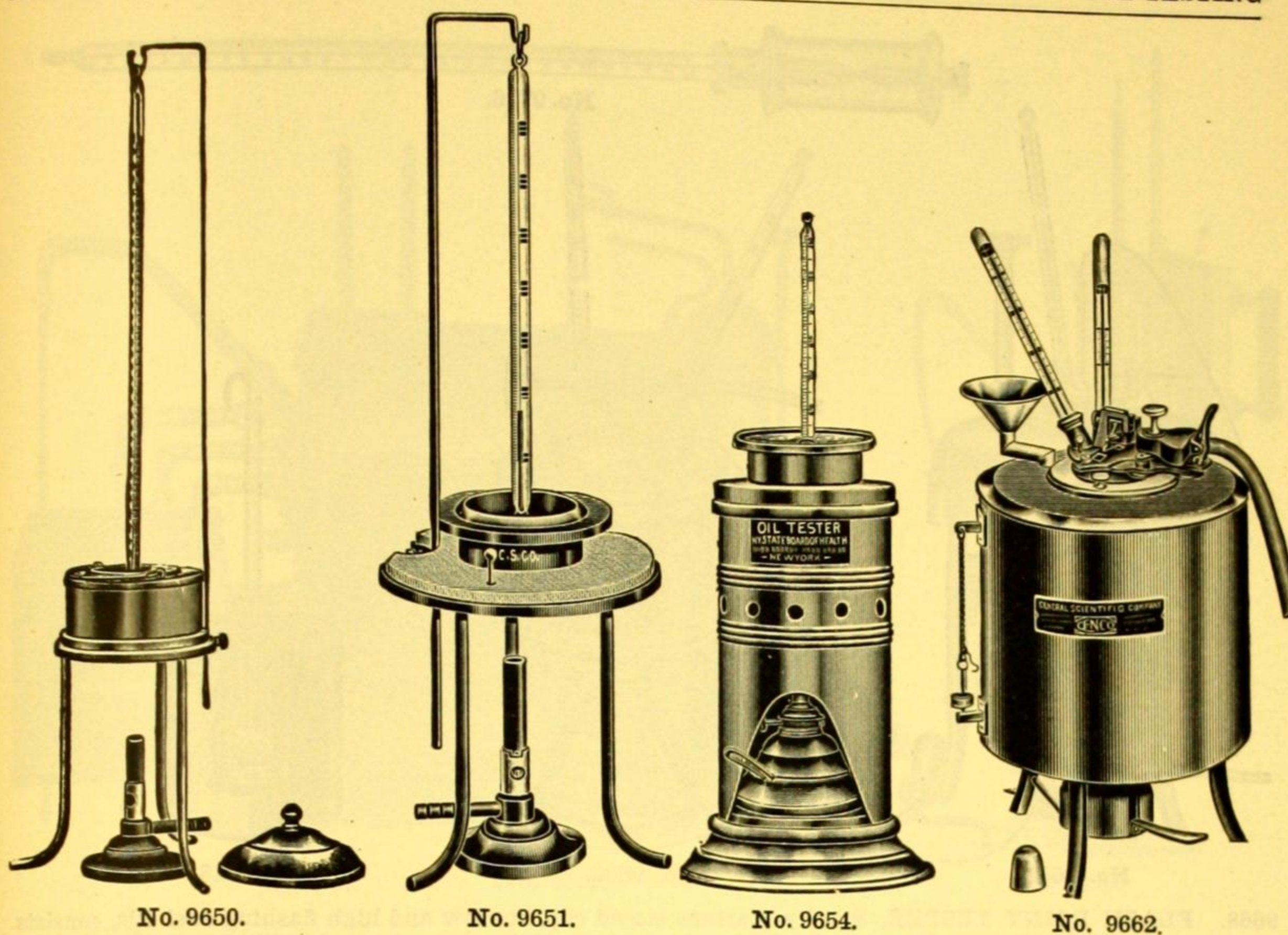
A variable rheostat is mounted in the same case with the heating coil, permitting the temperature to be raised or lowered at will.

The heater is furnished with a clamp, permitting it to be mounted on any laboratory support stand. Many additional uses will be found for this device in the laboratory, as it furnishes a rapid and efficient source of concentrated heat which will be found preferable to a gas flame for many operations.

Since it was first announced, over 1,500 of the **Cenco Heaters** have been placed in laboratories, from which have come enthusiastic reports of their performance and of their adaptability for widely varying purposes. A test conducted by the U. S. Bureau of Mines on one of the first models gave over 500 hours of continuous use. Since then, improvements have been made in method of construction and character of materials used, as a result of which the Bureau of Mines recently reported **over 1,000 hours of use and no evidence of deterioration**.

No.	A	B	C	D
For volts	110	220	110	220
Diameter of opening, inches.....	$1\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$
Each	15.00	16.00	16.00	17.00

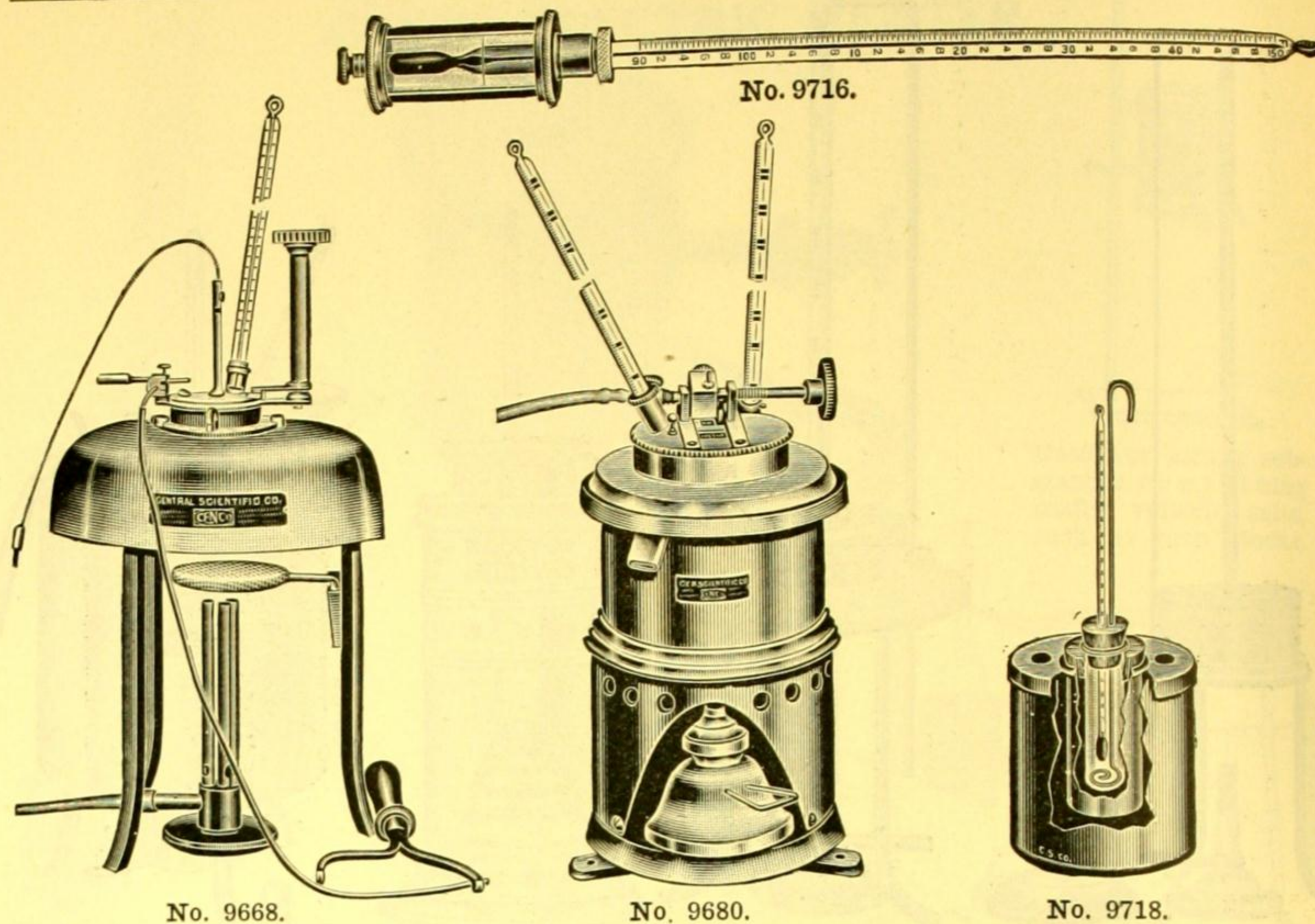
Note.—For further descriptions, accessories and prices see page 367; also send for Bulletins Nos. 47 and 93.



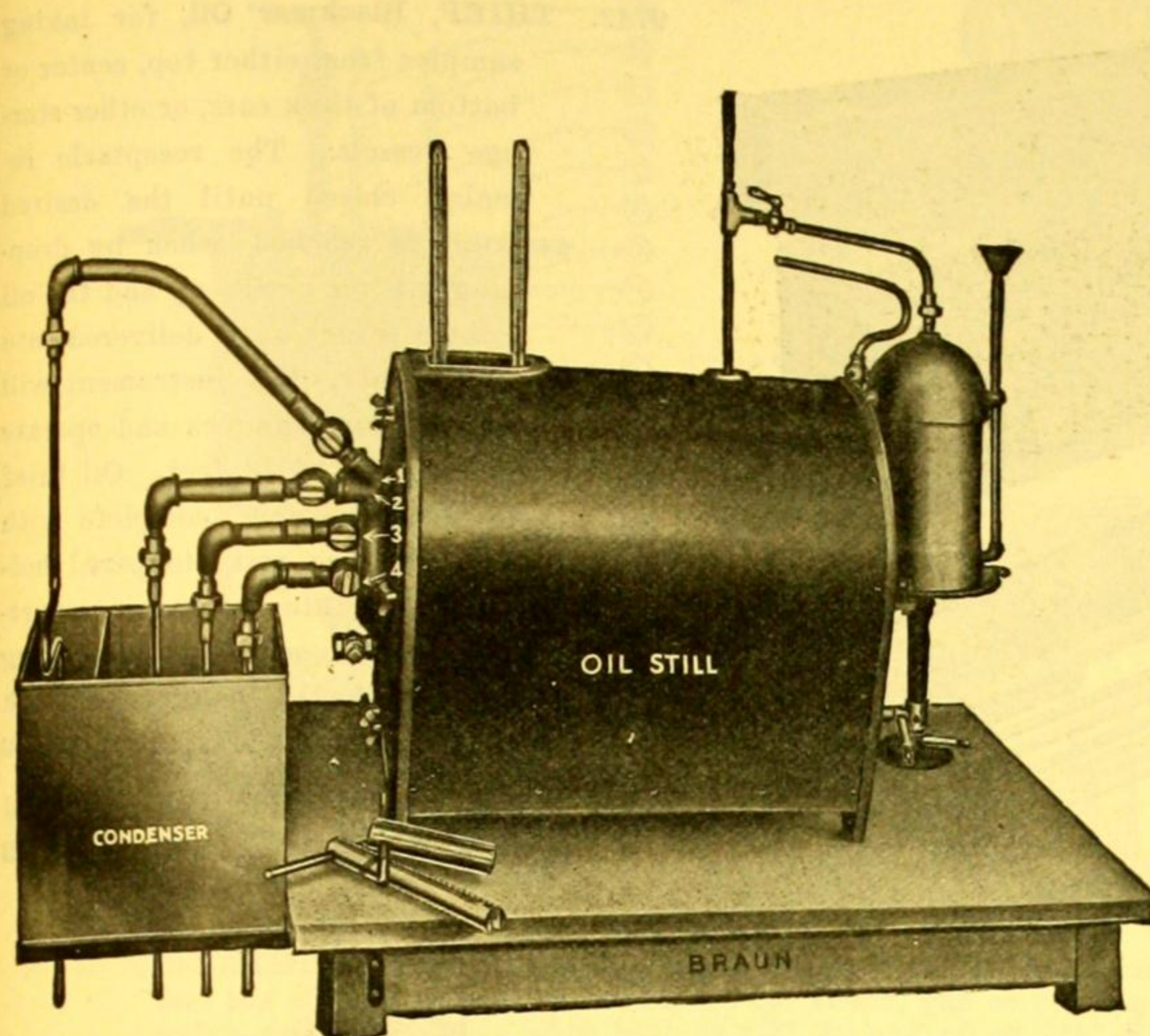
FLASH POINT TESTERS

9650. **FLASH POINT TESTER, Cleveland Open Cup**, for high grade lubricating, mineral seal, and signal oils, with cup made of heavy brass casting, nickel-plated. Complete with solid stem flash point thermometer, graduated from 20° to 760° F., and Bunsen burner for gas. (See Bulletin No. 314 of the U. S. Bureau of Public Roads.) \$18.00
- 13636G. **THERMOMETER** only for No. 9650, graduated from 20° to 760° F. in 2° divisions, scaled for one inch immersion 7.00
9651. **FLASH POINT TESTER, Cleveland Open Cup**, modified to comply with A. S. T. M. Tentative Specifications for 1921 (No. D92-21T), provided with a metal plate covered with an asbestos board and a bead of proper size for testing the gas flame. Complete with standard flash point thermometer graduated to 760° F. in 5° divisions and Bunsen burner for gas.... 18.00
13632. **THERMOMETER** only for No. 9651, solid stem, graduated from 20° to 760° F. in 5° divisions, scaled for one inch immersion..... 7.00
9654. **FLASH POINT TESTER, Elliott's or New York Testing Laboratory Type**, closed cup, for testing low or high flash oils and asphalts. Complete with glass cover, solid stem thermometer graduated to 300° F., spirit lamp, thermometer holder, and directions for use. (See Bulletin 314 of the U. S. Dept. of Agriculture, Bureau of Public Roads; also "Laboratory Manual of Bituminous Materials," by Prevost Hubbard.) 12.50
9655. **PERFORATED GLASS COVERS** for No. 9654each, .70
- 13636B. **THERMOMETER** only for No. 9654, graduated from 20° to 300° F. in 1° divisions, scaled for one inch immersion..... 3.00
9662. **FLASH POINT TESTER, Abel-Pensky closed cup**, for low flashing oils, with clock work to open cover and apply flame. With two thermometers graduated from 10° to 50° C. in ½° and 40° to 110° C. in 1°, and burner. Complete in portable case with instructions for operation. (See Technical Paper No. 49 of the United States Bureau of Mines.) 100.00
9663. **THERMOMETERS** for No. 9662, enclosed scale, with metal ferrule.
- | No. | A | B |
|-----------------------|-------|--------|
| Range, degrees C..... | 10-50 | 40-110 |
| Each | 6.00 | 6.00 |

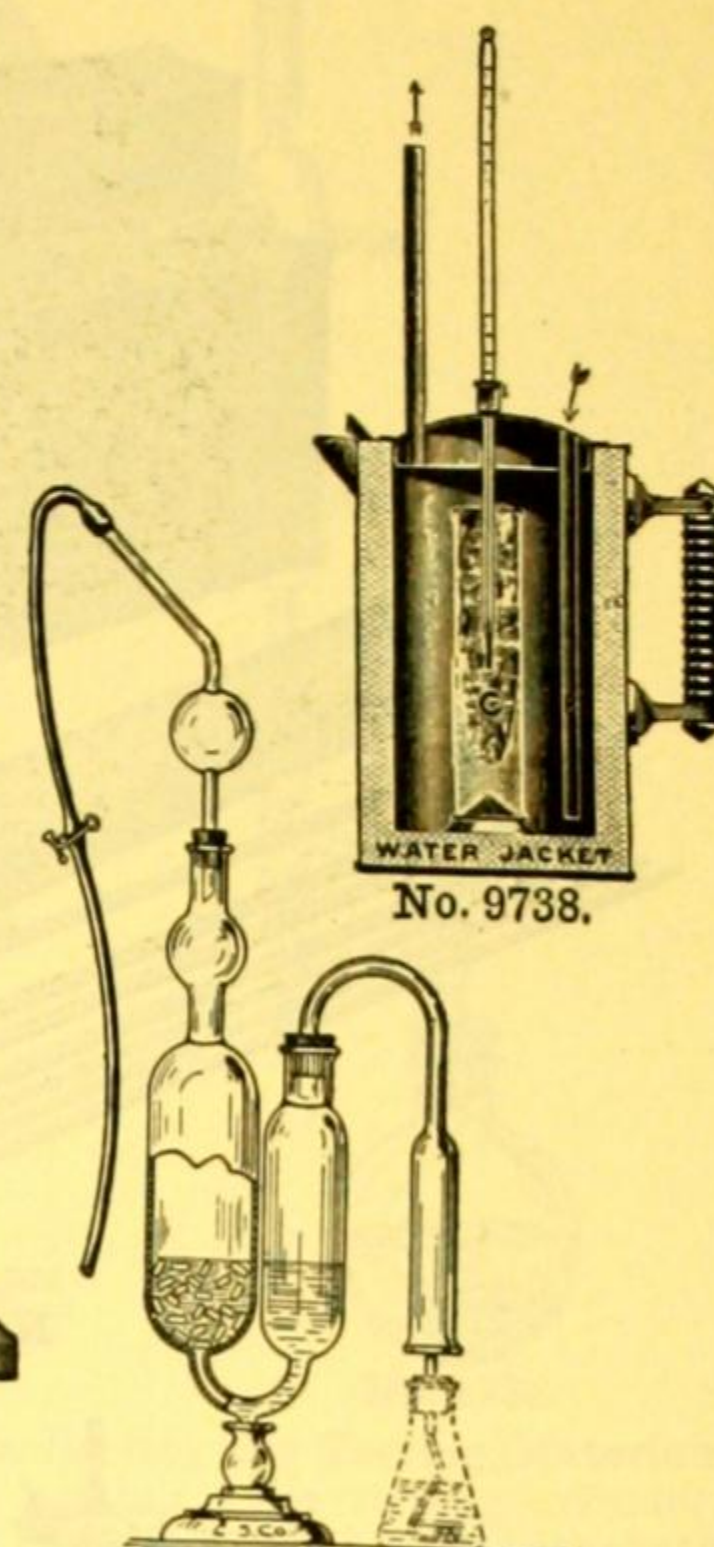
Note.—For Aneroid Barometer for use with flash point testers, see general heading **Barometers**.



9668. **FLASH POINT TESTER**, Pensky-Martens closed cup, for low and high flashing fuel oils, consists of an oil cup with cover in a metal heating vessel surrounded with a flanged top to prevent loss of heat by radiation. It is provided with spring device to open cover and apply the test flame, two thermometers, cup lifter, gas burner and directions for use. (See Technical Paper No. 298 of the U. S. Bureau of Mines, and A. S. T. M. Standard Specifications for 1921, No. D93-21T.) \$80.00
9682. **THERMOMETERS**, for No. 9668, for use in oil cup, scaled for $2\frac{1}{4}$ inch immersion, and provided with metal ferrule. No. A C
 Range, degrees F. 20-230 200-700
 Size of subdivisions, degrees F. 1 5
 Each 4.25 8.25
9680. **FLASH POINT TESTER**, "Tag" Closed Form, for kerosene, volatile liquids and fuel oils, adopted by the American Society for Testing Materials and the National Paint, Oil and Varnish Manufacturers' Association. Complete with two Fahrenheit thermometers, spirit lamp, and test-flame burner tip. (See Standard Specifications of the A. S. T. M. for 1921, No. D56-21.) 48.00
9681. **FLASH POINT TESTER**, "Tag" Closed Form, same as No. 9680 but furnished with two Centigrade thermometers 48.00
9682. **THERMOMETERS**, only for Nos. 9680 and 9681, solid stem, scaled for $2\frac{1}{4}$ inch immersion, graduated in 1° divisions, with ferrule. No. A B
 For tester No. 9680 9681
 Range, degrees 20-230F. 0-110C.
 Each 4.25 4.50
9710. **MANUAL** for Inspectors of Petroleum, containing correction tables for hydrometers, enabling the true gravity at any temperature to be determined at a glance. For both 141.5 Modulus and 140 Modulus 1.60
9716. **MELTING POINT TESTER**, for Wax, consisting of a glass cup for the wax to be tested, with a removable metal top in which is set a thermometer graduated from 90° to 150° F., in $\frac{1}{2}^\circ$ divisions. The melted wax is poured into the cup to an indicated level. A spiral stirrer, supplied with the improved tester to eliminate the old shaking method, is put in place, the cap with thermometer adjusted over the cup, and the stirrer manipulated until the wax shows signs of congealing. The process of congealing continues is noted as the melting point. By means of this instrument the melting point of a wax may be measured within $\frac{1}{2}^\circ$ F. Complete as described with thermometer 12.50
9718. **MELTING POINT APPARATUS**, for Paraffin Wax, according to requirements of the American Society for Testing Materials, consisting of a standard test tube provided with a cork ring gasket; a wire stirrer for stirring the contents of the tube; a metal air bath; a metal water bath with cover provided with thermometer hole and slot for stirrer, and a standard melting point thermometer graduated from 80° to 160° F. in 0.2° divisions and scaled for $3\frac{1}{8}$ inch immersion. Complete as described. (See A. S. T. M. Tentative Specifications for 1921, No. D8721T.) 14.00



No. 9730.



No. 13020.

13653. **THERMOMETER**, only for No. 9718, solid stem, graduated from 80° to 160° F. in 0.2° divisions, sealed for 3 1/8 inch immersion..... \$8.00

9720. **OIL TABLES**, Tycos, containing all the data concerning gravities, temperatures, conversion tables, etc., of interest to the oil man..... 1.00

SAMPLE BOTTLES, for Oil, see general heading **Bottles**.

SAMPLE MAILING CASES, for Oil Sample Bottles, see No. 5989.

SEPARATORY FUNNELS, see general heading **Funnels**.

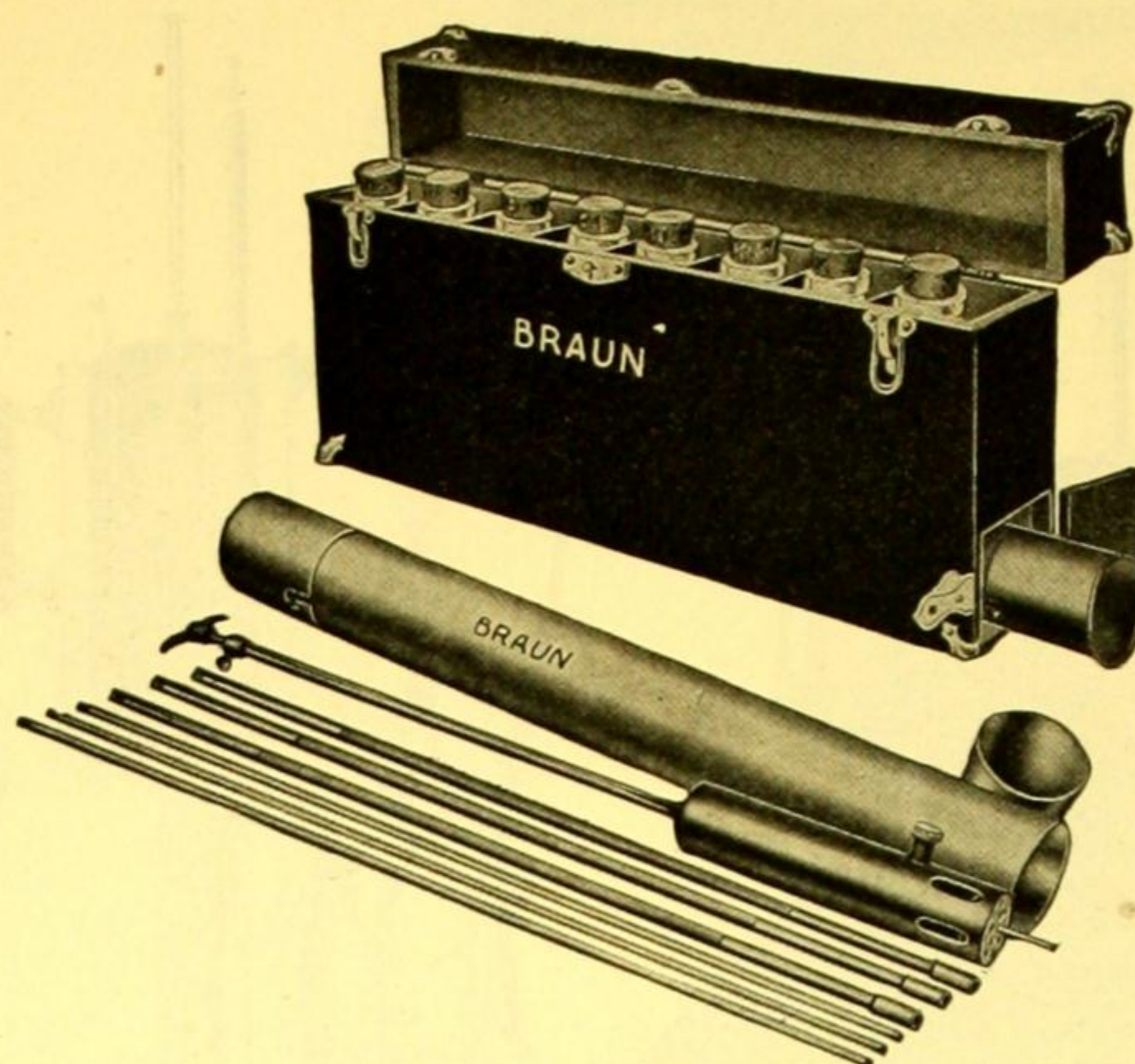
9730. **STILL**, Brown Oil, for fractionations and general distillations, constructed to meet the most exacting requirements. The still is made of cast iron surrounded by a cast iron frame, mounted inside of a fire-brick furnace of the same general shape. The flame from the Bunsen burners plays between the frame surrounding the still and the fire-brick furnace. The still proper is heated only by heat which passes through the walls of the iron frame surrounding it. By this construction the top and bottom of the still may be kept at the same temperature; or, if desired, the top can be kept heated to a higher temperature, or vice versa, by a slight adjustment of the flame entering the fire chamber. It is necessary when running an emulsified oil to keep the top of the still somewhat hotter than the bottom. The still permits the use of a sample sufficient in size to afford cuts that can be treated or otherwise examined; and it fractionates where fractionation is desired. Two large Bunsen burners are included; one for heating the still, and one for generating steam. Capacity of still, one gallon (half full). Complete as described with four vapor lines and discharge pipes, condenser with four compartments, discharge outlet, steam generator and super-heater, Bunsen burners, three thermometer openings and large opening for cleaning purposes, with directions for use, **without thermometers**..... 195.00

STOP-WATCHES, see general heading **Stop-Watches**.

13020. **SULPHUR APPARATUS**, for the determination of sulphur in naphthas and illuminating oils, consisting of a glass absorber mounted on a wooden base, a chimney and a spray trap, all of chemically resistant glass. A small lamp, which is necessary, but not included with the apparatus, may conveniently consist of a 25 cc Erlenmeyer flask, a cork carrying a short section of glass tubing about 1/8 inch inside diameter and ordinary cotton wicking. (See A. S. T. M. Tentative Specifications for 1921, No. D90-21T.) 3.75

9738. **TESTER**, Mackey's Spontaneous Combustion, for testing oils or oily mixtures for liability to produce spontaneous combustion. The apparatus consists essentially of a double walled cylindrical copper water bath with asbestos packed cover, carrying two air circulation tubes. Height inside, 7 inches; diameter inside, 4 inches. Complete with thermometer reading from 0° to 250° C., 6 wire gauze cylinders, 1 pound absorbent cotton, Bunsen burner, support stand and 50 cc graduated cylinder..... 40.00

THERMOMETERS, see general heading **Thermometers**.



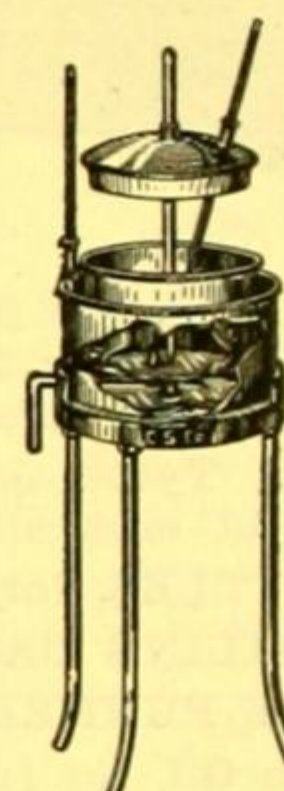
No. 9742.

9742. **THIEF, Blackmar Oil**, for taking samples from either top, center or bottom of tank cars, or other storage vessels. The receptacle remains closed until the desired point is reached when by dropping a lever it fills up and the oil is held intact until delivered into a container. The instrument will take 8-ounce samples and operate to a depth of 12 feet. Oil thief is in a zinc case, complete with eight 8-ounce cork stoppered bottles fitted into separate compartments in a substantial carrying case 25x11x3½ inches, with lock and handle \$50.00

9746. **THIEF, Glass, for Oil**, improved form with rubber bumper. 2.75



No. 9756.



No. 9759.

VISCOSIMETERS

9756. **VISCOSIMETER, Engler**, latest form, for light and heavy oils. Consists of a gold-plated oil cup with platinum outlet tube, surrounded by a brass water bath. Complete with two standard thermometers 10° to 50° C. and 10° to 150° C., flask graduated at 200 cc and tripod with ring burner. (See Bulletin 314 of the U. S. Dept. of Agriculture, Bureau of Public Roads.) \$80.00

9757. **FLASK**, only of No. 9756, graduated at 200 cc. With government certificate 3.75

5788B. **FLASK**, only of No. 9756, same as No. 9757, but without certificate70

9759. **VISCOSIMETER, Ubbelohde**, for gasoline and kerosene, similar to Engler in having a large shallow container but differs in diameter of outlet tube, and in being provided with an overflow pipe to determine the initial level, instead of gage points as in the Engler. Complete with thermometer 50° to 100° C., flask and tripod with ring burner 90.00

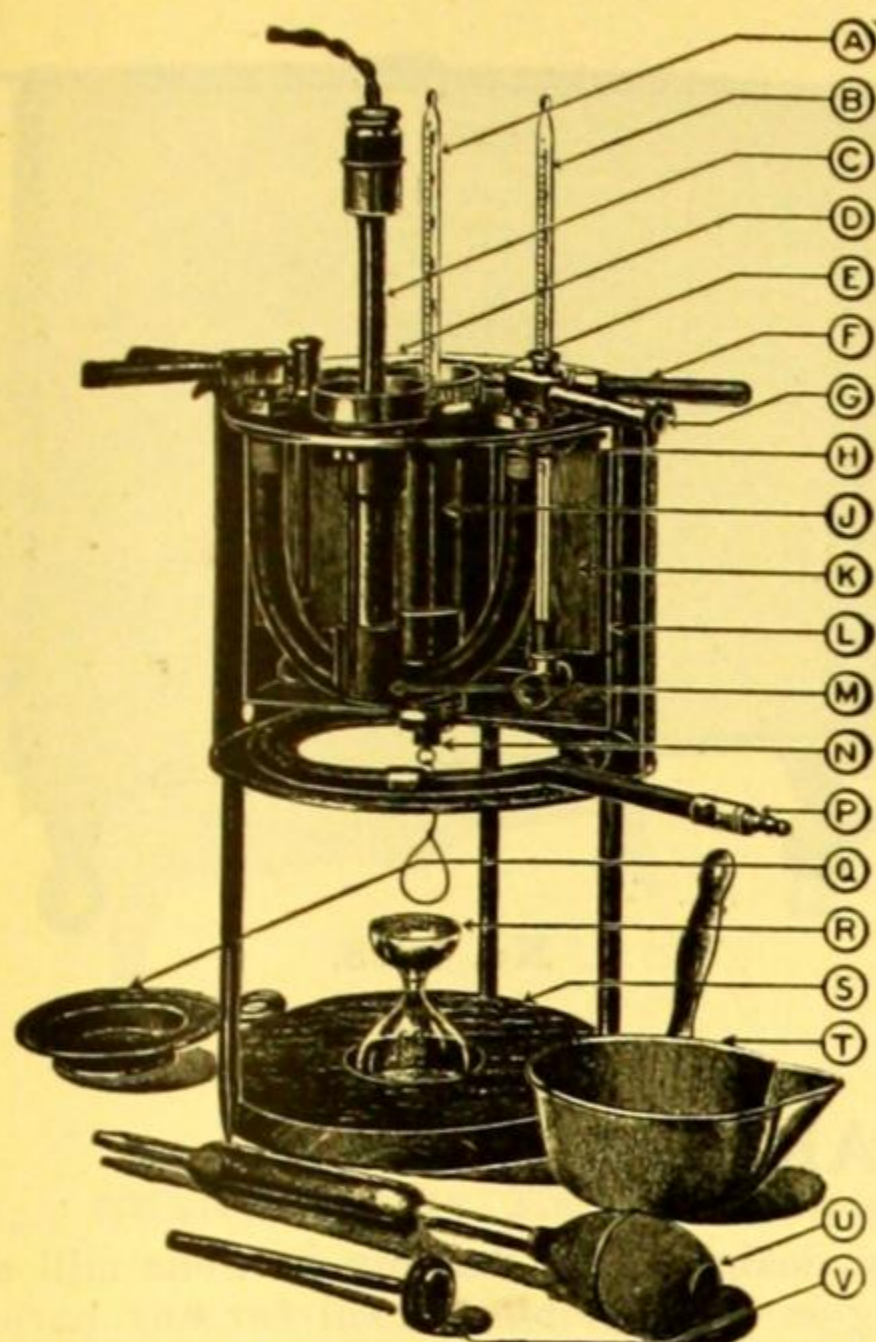
5788A. **FLASK** only, of No. 9759, graduated at 100 cc50

13644. **THERMOMETERS**, only for Nos. 9756 and 9759.

No.	A	B	C
Range, degrees C.	10-50	10-150	10-200
Each	5.25	5.25	6.25

13645. **THERMOMETERS**, same as above, but with government certificate.

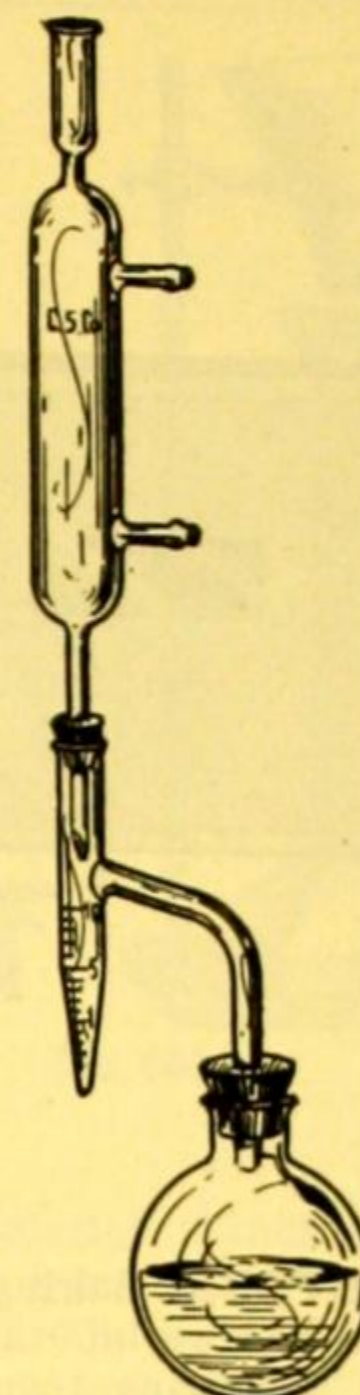
No.	A	B	C
Range, degrees C.	10-50	10-150	10-200
Each	7.00	7.15	8.25



No. 9760.



No. 9766.



No. 9784.

9760. **VISCOSIMETER, Saybolt Universal**, as adopted by the American Society for Testing Materials and the U. S. Government. Adapted for steam, gas or electric heating. For testing cylinder, valve, and similar oils, with bath at 212° F., and oil at 210° F.; reduced black oils with bath and oil at 130° F.; and neutral spindle, paraffin, red and other distilled oils, with bath and oil at 100° F., or at any temperature from 70° F. to 212° F. Complete with electric immersion heating device with connecting cord and attachment plug, steam heater, gas burner, turn-table stirring arrangement, six thermometers, graduated flask, as illustrated, **without stop-watch**. (See A. S. T. M. Specifications for 1920, No. D47-20.)

No.	A	B
For volts	110	220
Each	\$92.50	92.50

12954. **STOP-WATCH**, for No. 9760. 12.80
Electric Immersion Heater for Saybolt Viscosimeter, see No. 7520 under general heading Heaters.

9761. **FLASK, Pyrex glass**, for No. 9760, graduated at 60 cc. 1.25

9762. **THERMOMETERS** for No. 9760, solid stem, engraved scale.

No.	A	B	C
Range, degrees F.	70-110	100-140	180-220
Each	2.50	2.50	2.50

9764. **VISCOSIMETER, Saybolt Furol**, similar in design and principle to the Saybolt Universal, but modified to reduce the time required for testing road, fuel and other heavy oils. Viscosity is determined at 122° F. and is expressed as the number of seconds, Saybolt Furol; being the time in seconds for the delivery of 60 cc of oil. Complete with all accessories as listed under No. 9760 Saybolt Universal, **without stop-watch**. (See A. S. T. M. Tentative Specifications for 1921, No. D88-21T, and Bulletin No. 5 of the U. S. Bureau of Mines.)

No.	A	B
For volts	110	220
Each	92.50	92.50

9766. **VISCOSIMETER, Scott, for thin or viscous liquids**. Each instrument is standardized and has stamped upon the handle the time in seconds for efflux of 50 cc of distilled water at 70° F. Complete with accurate thermometer graduated to 212° F. in single degrees, 50 cc graduated cylinder, and with instructions for use, but without burner. 20.00

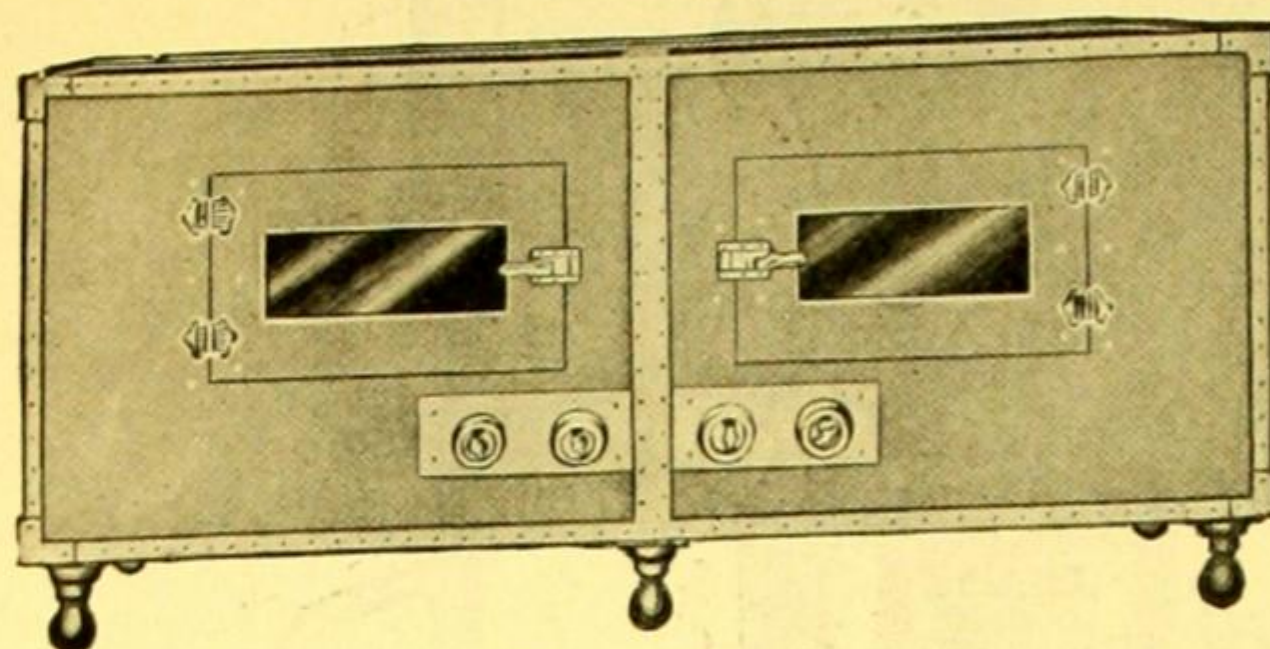
9784. **WATER DETERMINATION APPARATUS, Dean-Stark**, for the determination of water in petroleum products. Consists of a round bottom glass flask, a graduated receiving tube, and a condenser. Can be used with sand bath and gas burner, or No. 9647 Cenco Electric Heater. (See A. S. T. M. Tentative Specifications for 1921, D96-21T.) 4.50
 A. S. T. M. Tentative Specifications for 1921, D96-21T.) 1.00

9785. **Receiver**, only for No. 9784.38

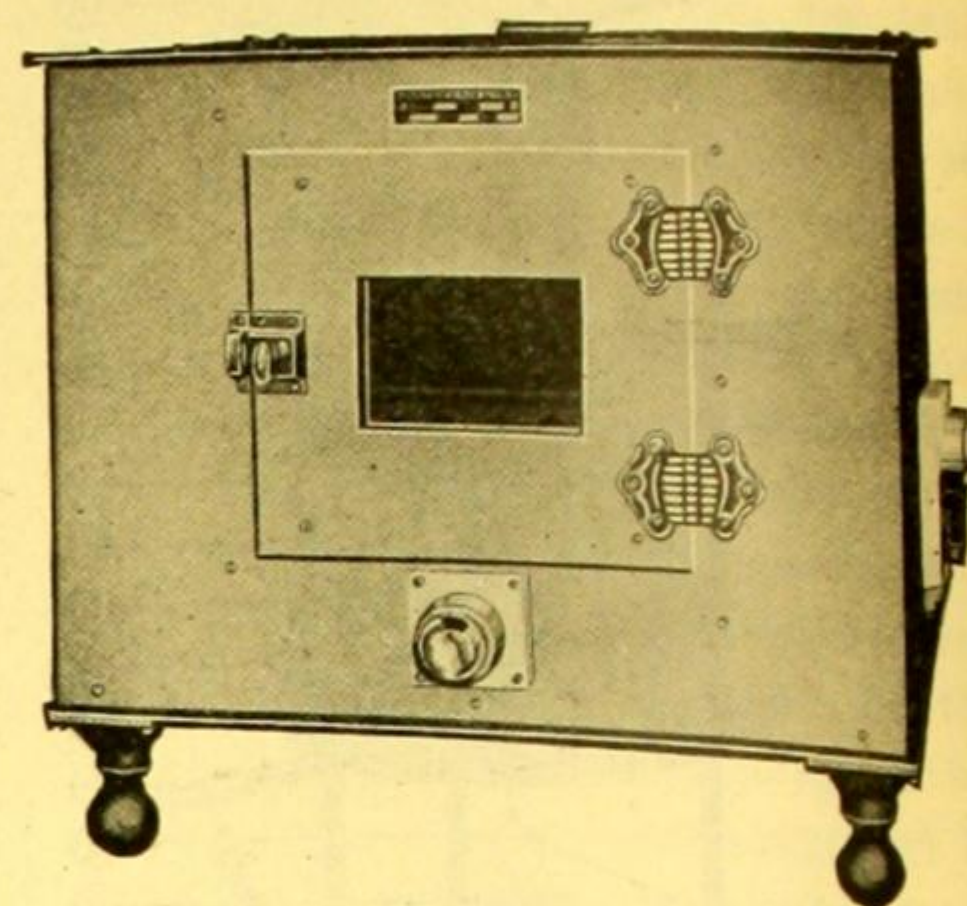
5558. **Flask**, only for No. 9784, capacity 500 cc. 6.25

9647. **HEATER, Cenco Electric**, with transite top with beveled opening 2½ inches in diameter, for use with No. 9784 Water Determination Apparatus.

No.	C	D
For volts	110	220
Each	16.00	17.00



No. 9800.



No. 9808.

OVENS, ELECTRIC BAKING

OVENS, Baking, Despatch Electric, large size, specially designed for testing in flour mill and baking laboratories where accurate and uniform baking is desired, but useful for any purpose requiring temperatures up to 500°F. or 260°C. They are made of polished steel with angle iron corner construction; have two-inch solid heat-retaining walls of asbestos throughout, two doors with double glass observation windows, two ventilators in top and bottom; and are equipped with Despatch Open Wire Electric Heaters, wound with a special alloy wire which does not oxidize nor become brittle. These ovens have vitrified tile inner top and hard asbestos floor plates. All corner work, legs and trimmings are highly polished and nickel-plated. The ovens require about 1½ hours to heat to 500°F., then the current should be shut off and baking accomplished without further use of current, except in regulating and holding the heat at certain temperatures as desired. They are practically cool outside when in use and there is absolutely no danger of fire. All sizes are 22 inches deep and 27 inches high outside, and have a baking space 18 inches deep and 11 inches high.

No.	100
Length, outside, inches.....	44
Baking space length, inches.....	40
Size of doors, inches.....	11x14
Regulating switches	2
Max. current consumption, watts.....	2600

9800. For 110 volts..... \$170.00

OVENS, Baking, Despatch Electric, of same construction as No. 9800, but smaller, with one door. The door is fitted with double plate glass observation windows. A three heat switch system gives the operator control by means of which the heat can be held at any desired temperature indefinitely, with a very low current consumption. The tile top with which the baking space in these ovens is made contributes not only to low current consumption, but supplies the place of a top heater and tends to uniformity of heat throughout the baking space.

No.	402
Outside dimensions, inches.....	24x19x22
Baking space, inches.....	20x10x18
Size of doors, inches.....	10x12
Removable shelves	2
Current consumption, watts.....	600 to 1800

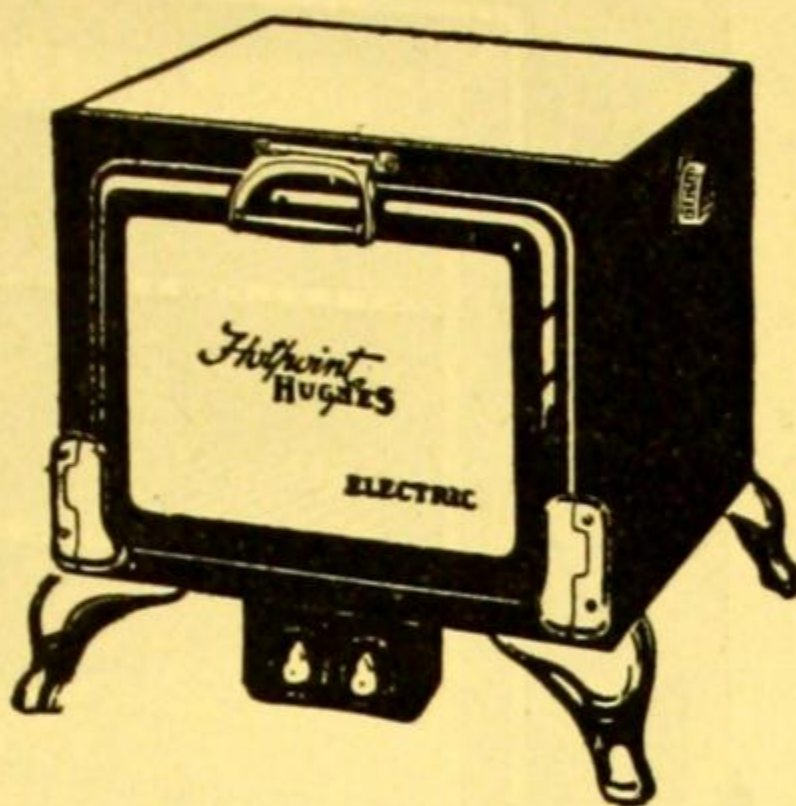
9804. For 110 volts..... 130.00

9808. **OVENS, Baking, Despatch Electric No. 90,** designed to meet the requirements of the small laboratory for test baking. This oven is intended for use in connection with Proofing Cabinet No. 5982, but may be used for any purpose requiring an electrically heated oven capable of furnishing a temperature up to 500°F. Constructed of polished steel with double walls packed with mineral wool, top and bottom heaters arranged for three heats, and glass observation door. Depth of heating space, 12 inches; length, 20 inches; height, 11 inches; current consumption on high heat, 1000 watts; on medium heat, 500 watts; on low heat, 250 watts. Capacity, 4 loaves.

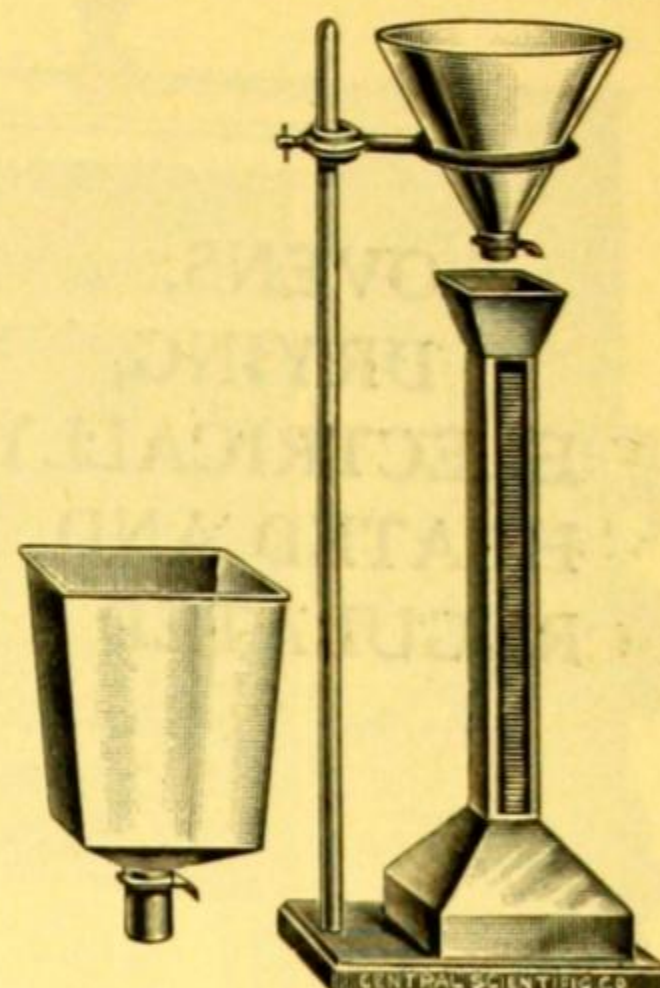
No.	A	B
For volts.....	110	220
Each	66.00	66.00



No. 9812.



No. 9818.



No. 6026.

9812. **OVENS, Baking, Hughes Electric.** The walls and the doors have an insulation 2 inches thick, and the construction of the door makes it practically heat tight. The oven is provided with a three point switch, giving a current consumption of 150, 300 and 600 watts. A temperature of 450°F. is reached in 20 minutes, and a maximum temperature of 600°F. may be attained, which may then be maintained indefinitely with the switch at low heat. Inside dimensions, 11x11x9 inches. Shipping weight, 55 pounds. Complete with temperature indicator, attachment plug and cord.

No.	A
For volts.....	110
Each	\$25.00

9818. **OVENS, Baking, Hughes Electric,** similar to No. 9812, but of better construction, with nickel-plated legs and trim, and with the face of the door finished in white enamel. The oven has two heating units, one each at top and bottom, controlled by separate switches, giving 7 degrees of heat. Each burner consumes 375, 750, and 1500 watts at low, medium and high heats. A maximum temperature of 600°F. may be obtained, of which 450°F. is reached in 15 minutes, and the oven is so well insulated that it has been found on a pyrometer test that a baking temperature will be maintained for an hour after the heat has been completely turned off. Inside dimensions, 18x18x14 inches. Shipping weight, 125 pounds. Complete with temperature indicator.

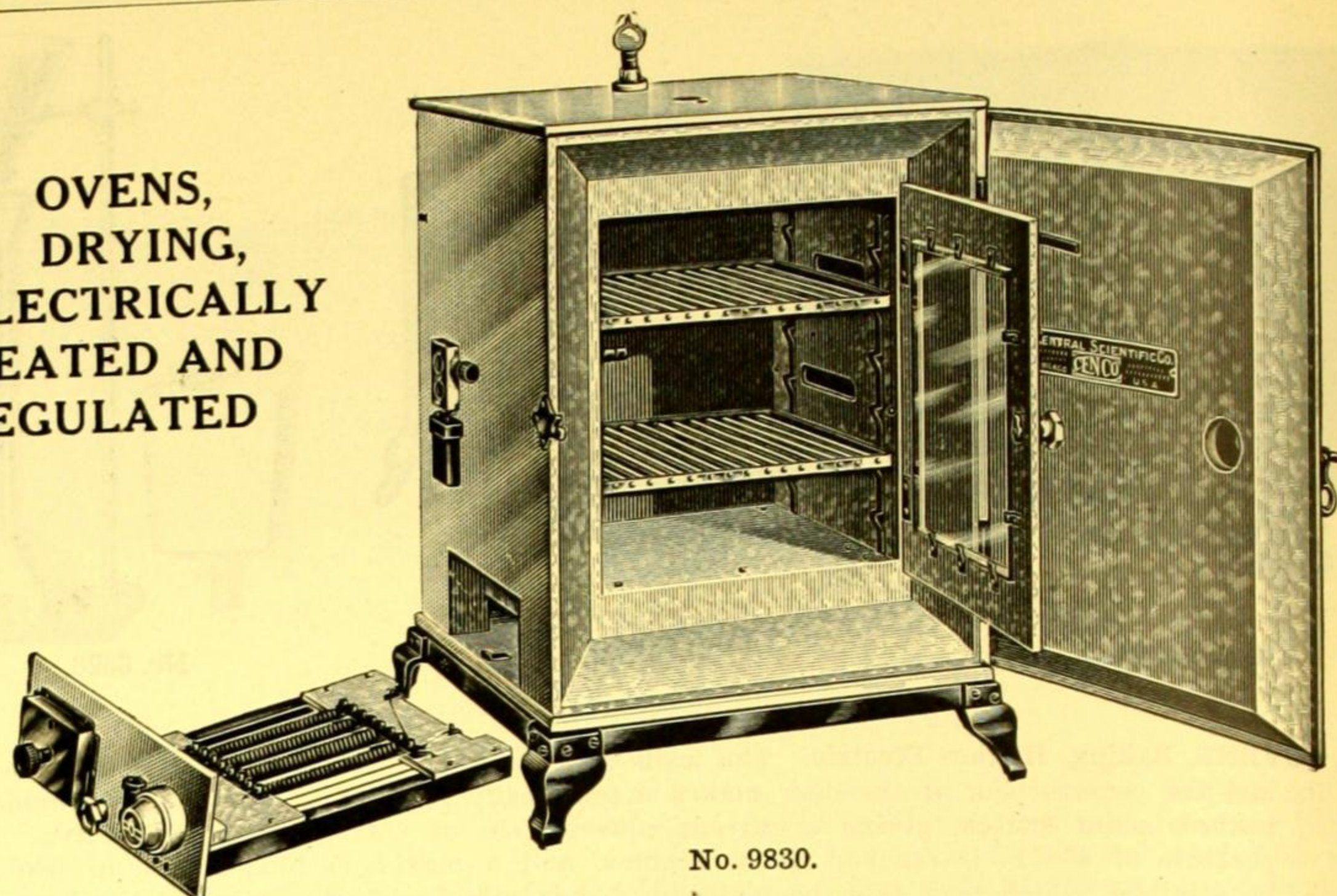
No.	A
For volts.....	110
Each	\$85.00

We carry in stock a complete line of equipment for milling, baking and grain testing laboratories, including electric baking ovens, proofing cabinets, drying ovens, balances, etc. For a list of milling and baking apparatus see section on **Flour Testing Apparatus** in this catalog, or write for our Catalog G on Baking, Milling and Grain Testing Apparatus. Of the many items listed in our catalogs, a large number are made in our own factory under the supervision of a staff of trained engineers. The apparatus listed below is one of our specialties.

6026. **VOLUME OF LOAF APPARATUS,** for determining the volume of loaves of bread by displacement of flax or other seed. Consists of a vessel of known capacity, sufficiently large to contain loaves baked in Baking Pans Nos. 5960 and 5962, having an upright tube with graduated glass face and an auxiliary funnel. In use, the bread is placed in the first container, which is then filled level full with seed. The seed is then emptied into the auxiliary funnel, and from this funnel flows evenly into the measuring vessel. From the height to which the seed rises on the graduated face of this vessel, the volume of the loaf may be read directly without calculation. For most efficient operation, the use of mustard, rape or millet seed is recommended. Of polished brass with suitable support, graduated in cubic centimeters for loaves ranging from 1500 to 3000 cc in volume

40.00

OVENS, DRYING, ELECTRICALLY HEATED AND REGULATED



No. 9830.

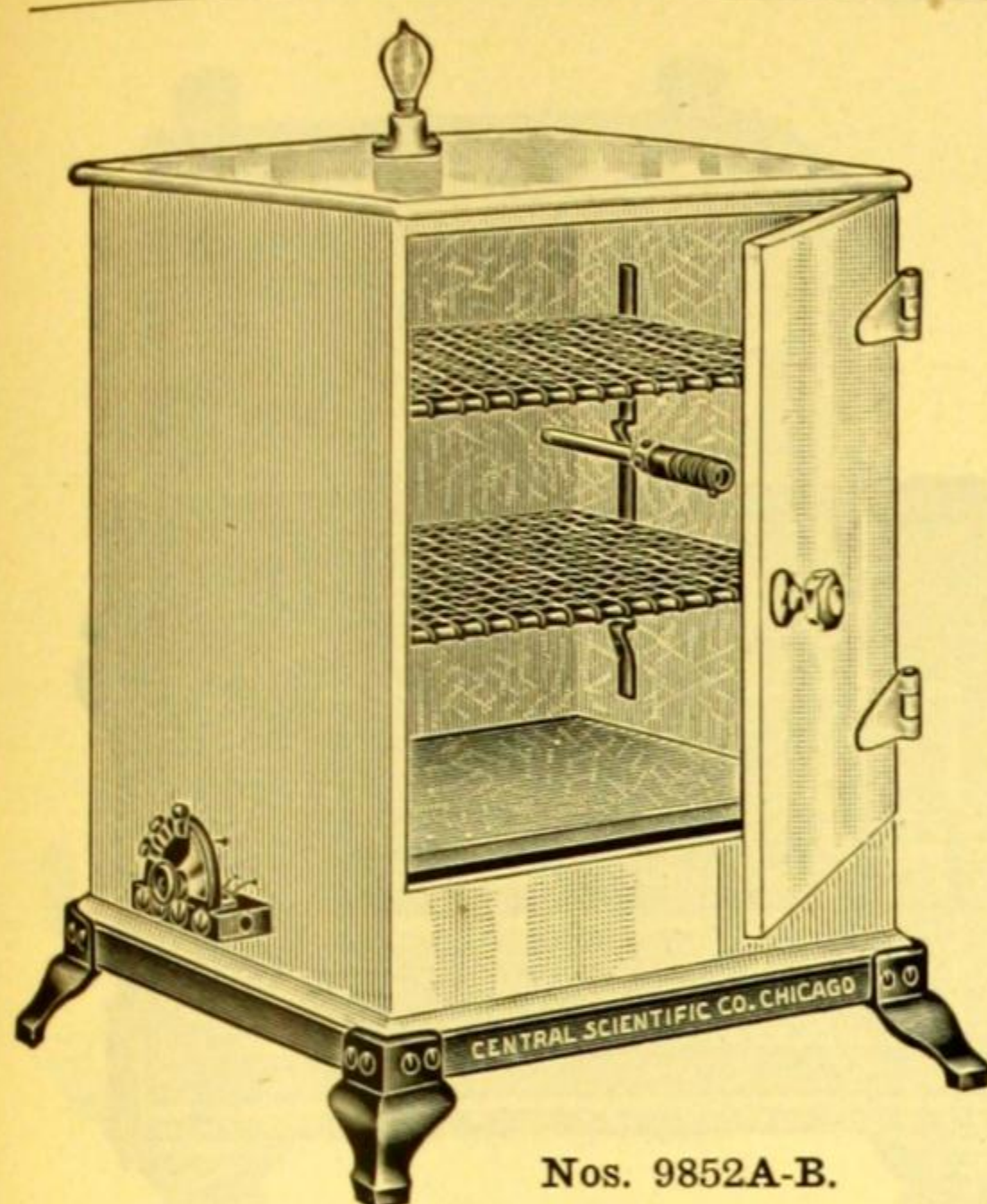
OVENS, Drying, Triple Wall, DeKhotinsky, Electrically Heated and Regulated (patented), with bimetallic regulator and new system of ventilation providing for greatest possible uniformity of temperature throughout the oven chamber.

Construction: These ovens are constructed of asbestos slate on a steel frame and are well finished in white enamel with all metal parts nickel-plated except the base, which is japanned. Three walls are provided, the space between the two outer walls being packed with the most efficient insulating material available, an 85 per cent. magnesia asbestos mixture, which effectually prevents radiation of the internal heat; and the space between the inner walls, used to conduct the heated air upward from the heating units in the base, aids in distributing the hot air uniformly. Ports are provided in the inside walls of the oven for the entrance of the heated air into the drying chamber, in which it passes up and out through an opening in the false top. The location of these ports has been carefully and scientifically determined so as to provide a continuous current of heated air to every corner of the drying chamber, making the temperature uniform throughout. This feature (patented) is peculiar to the DeKhotinsky Triple Wall Oven, and insures a uniformity of temperature not possible in electrically heated ovens of any other type. Double doors are also provided, the outer door being double walled and packed with the magnesia-asbestos heat insulating material while the inner door is of glass for the inspection of the interior without cooling the contents. The outer door is beveled on the edges, making close contact, when closed, with the walls, thus preventing leakage of heat. Between the two doors is a dead air space for insulation purposes.

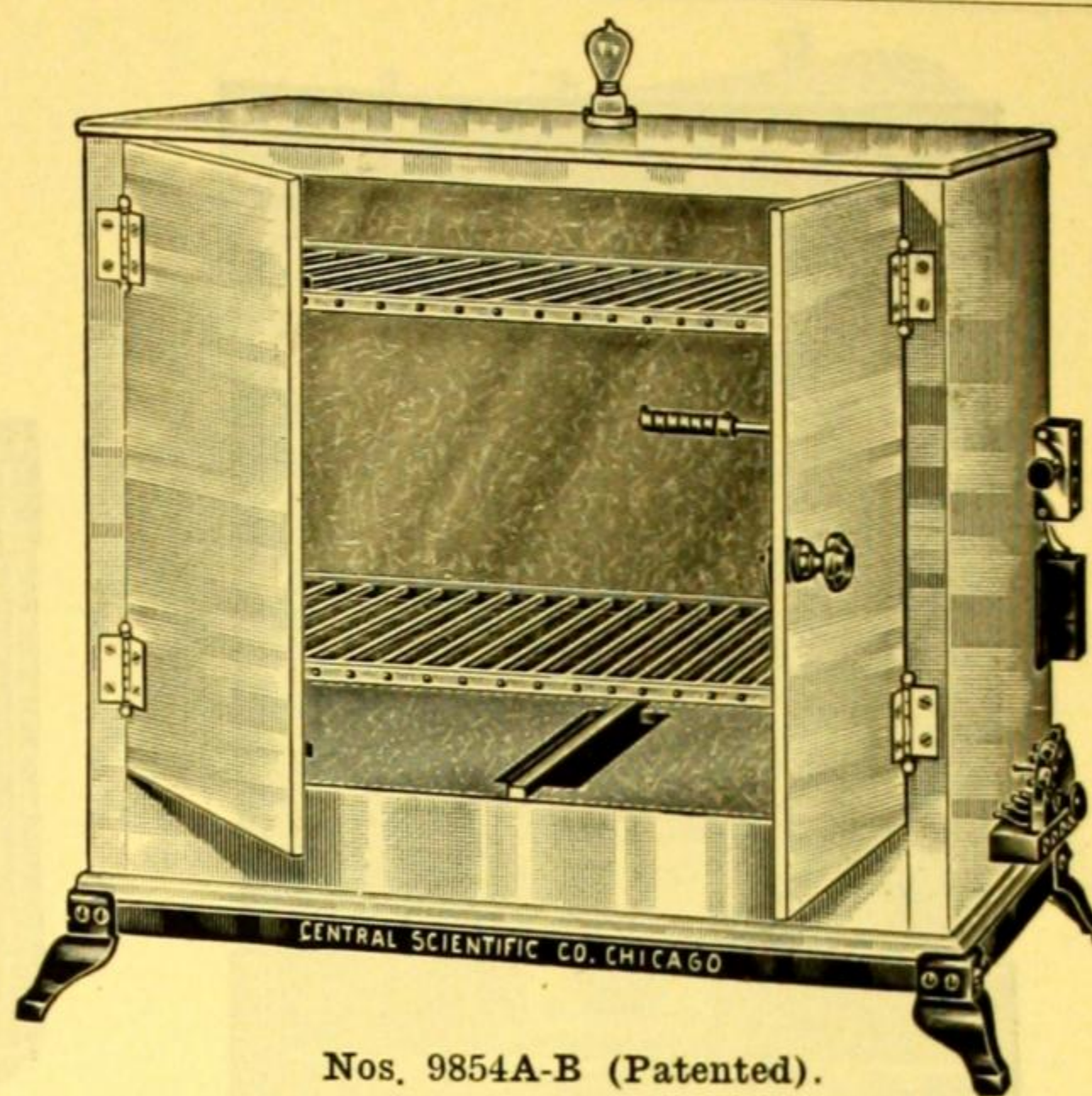
Heating of the oven is effected by means of our standard heating units of Chromel wire wound on mica strips. These heating units are mounted in a removable tray or drawer which facilitates their removal for inspection or replacement without disturbing or materially cooling the contents. One of these heating units is connected in series with the contact points of the thermo-regulator, while the remainder are connected in parallel to the switch contact springs and may be added to the circuit one at a time to obtain any desired temperature.

Temperature control of the oven is secured by means of our bimetallic thermo-regulator (patented) which is made from invar-brass ribbon, and can be set at any desired temperature from that of the surrounding air up to the maximum heat capacity of the oven. This range of temperature permits the use of these instruments as incubators, paraffine baths, drying ovens or sterilizers. The precision of action of this thermo-regulator is $\frac{1}{4}^{\circ}\text{C}$. The make-and-break contact of the thermo-regulator is located outside the oven, to prevent the possibility of ignition of inflammable gases, which often occurs when the contact is made and broken inside. A pilot lamp on top of the oven is connected in series with the thermo-regulator, enabling the operator to determine at a glance whether the oven is regulating. These instruments can be operated on either A.C. or D.C. circuits. Complete with receptacle and five feet of flexible asbestos covered cord with separate attachment plug.

	No.	B	C
Height inside, inches.....		14 $\frac{3}{4}$	19 $\frac{3}{4}$
Width inside, inches.....		12	17
Depth inside, inches.....		11 $\frac{3}{4}$	14
Shelf space, square inches.....		282	476
9830. For 110 volts.....		\$140.00	220.00
9831. For 220 volts.....		140.00	220.00



Nos. 9852A-B.



Nos. 9854A-B (Patented).

Note:—For **High Temperature Ovens** for temperatures up to 260°C., see No. 9926 DeKhotinsky Electrically Heated High Temperature Oven.

9840. **Extra Heating Units**, for DeKhotinsky ovens. Current consumption, 160 watts.

No.	A	B
For volts	110	220
Each	\$0.75	.75

Note:—In ordering replacement units for DeKhotinsky ovens it is necessary to give the serial number which will be found on the name plate.

8197. **Pilot Lamp**, only for DeKhotinsky ovens. Capacity, 0.4 ampere; for use on 6 volts..... .50

Note:—In ordering replacement lamps for DeKhotinsky ovens it is necessary to give the serial number which will be found on the name plate.

OVENS, Drying, Single Wall, Cenco, Electrically Heated and Regulated (patented), with DeKhotinsky bimetallic thermo-regulator. For work requiring the greatest precision of regulation and uniformity of temperature, we recommend our DeKhotinsky Triple Wall Drying Oven. (See description under No. 9830.)

Construction: The oven is built of 1/4-inch asbestos slate on a steel frame with a foundation of 3/8-inch asbestos slate. The heating units are placed in the bottom and the heat is distributed throughout the drying chamber by air drawn through openings in the bottom beneath the units and heated as it passes through and over them. As uniformity of temperature is not possible of attainment in a single wall oven, we make no claims for it in these ovens. Where uniformity is not essential, however, these ovens will be found very convenient and satisfactory. Two shelves of the grid type are provided, which, by means of racks, may be set at any desired height. The oven is mounted on a japanned steel base.

Heating of the oven is effected by means of our standard heating units of chromel wire wound on mica strips, some of which are connected to the switch and some to the bimetallic thermo-regulator for automatic control to the desired temperature.

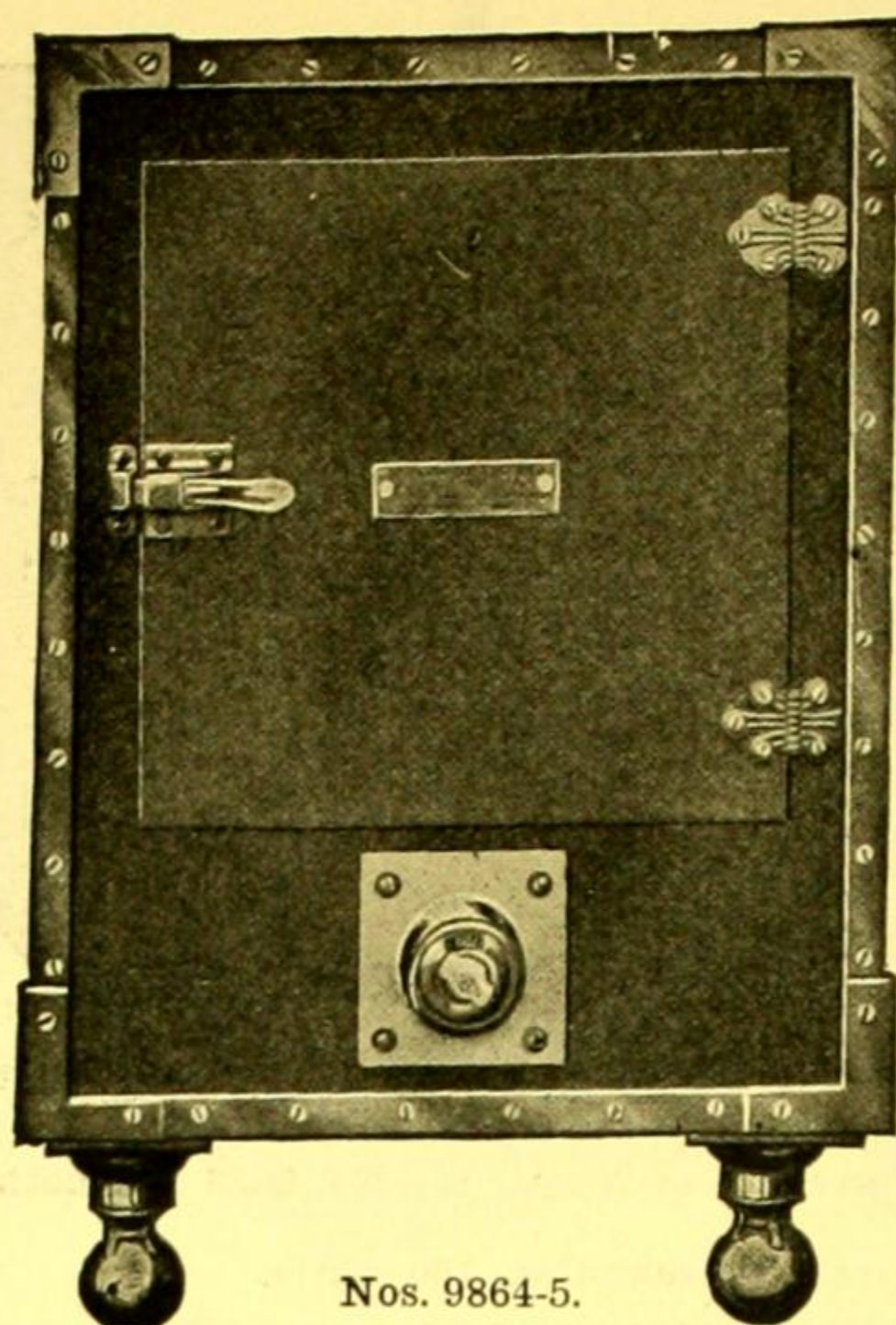
Temperature control of the oven is effected by means of the DeKhotinsky patented bimetallic thermo-regulator, which is made from invar-brass ribbon, and can be set at any desired temperature from that of the surrounding atmosphere to the maximum heat capacity of the oven, about 140° C, which it will maintain with a constancy of $\pm 1^\circ$ C. The make-and-break contact of the thermo-regulator is located outside the oven to prevent the possibility of ignition of inflammable gases developed in drying, which often occurs when the contact is made and broken inside the oven. A pilot lamp on top of the oven is connected in series with the thermo-regulator, enabling the operator to determine at a glance whether the oven is regulating. These ovens can be operated on either A.C. or D.C. circuits. Complete with receptacle, and 5 feet of flexible asbestos covered cord with attachment plug.

	Width, Inches	Depth, Inches	Height, Inches	Vol. Inside, Cu. Inches	Shelf Space, Sq. Inches	Voltage, A.C. & D.C.	Price
9852A.	11	10	12	1320	220	110	50.00
9852B.	11	10	12	1320	220	220	50.00

DRYING OVENS, Single Wall, Cenco, Electrically Heated and Regulated, of same construction as Nos. 9852A-B, but larger, with two doors and with a greater number of heating units. With same equipment as Nos. 9852A-B.

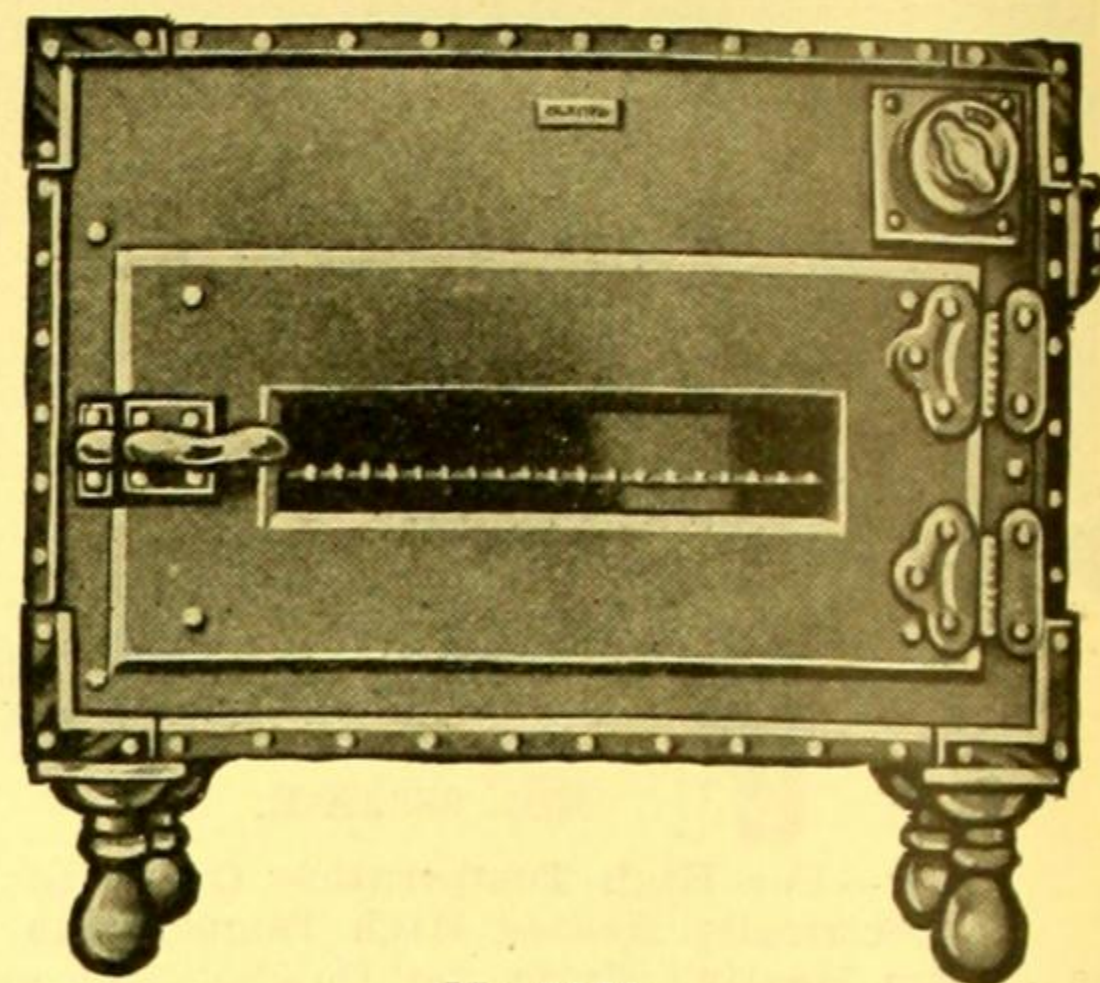
	Width, Inches	Depth, Inches	Height, Inches	Vol. Inside, Cu. Inches	Shelf Space, Sq. Inches	Voltage, A.C. & D.C.	Price
9854A.	18	12	14	3024	430	110	75.00
9854B.	18	12	14	3024	430	220	75.00

For Extra Heating Units for Nos. 9852A to 9854B, see No. 9840.



Nos. 9864-5.

(Showing a Single Compartment Oven,
Half the Size of No. 9864)



No. 9870.

OVENS, Drying, Despatch Electric, especially designed for moisture determinations in soils, flour, etc. They are practically uniform in temperature, having a three-point regulating switch, whereby the temperature can be held at 212°F. Provided with top and bottom ventilators, which greatly expedite the drying process. Made of polished steel with angle iron corner construction, and with all fittings nickel-plated, with 1-inch solid heat retaining walls of asbestos, and Despatch Open Wire Electric Heaters, wound with special alloy which will not oxidize nor become brittle. With two compartments, either of which may be used separately if desired, since they are non-interfering. Drying space of each compartment: 20 inches wide, 16 inches high, and 18 inches deep; size of doors, 16x20 inches; maximum power consumption of each compartment, 150 watts. (Illustration above is of a single compartment oven, but serves to show construction.)

No.	A
Outside dimensions, inches.....	50x24x22
Number of compartments.....	2
9864. For 110 volts.....	\$225.00
9865. For 220 volts.....	225.00

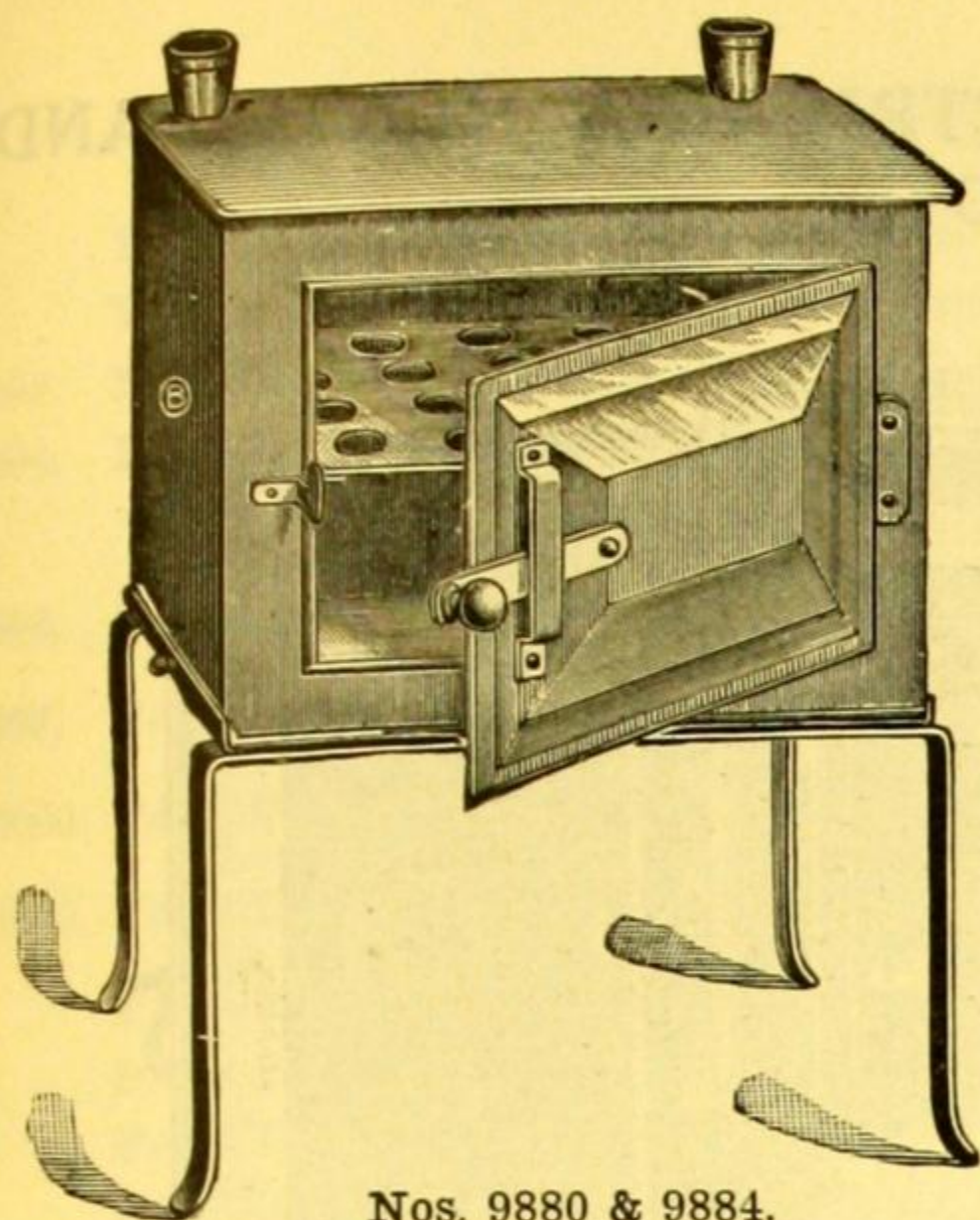
9870. **OVENS, Drying, Despatch Electric**, for moisture determinations in soil, flour, etc. Of special value in milling laboratories for Pekar slick tests. Similar in construction to that of No. 9864, but with observation window in the door so that tests can be watched without opening where. Being small and compact this oven can be easily moved and can be operated anywhere. Connection can be made with ordinary lamp socket. Outside dimensions: 18 inches wide, 14 inches high, 10 inches deep; drying space, 16 inches wide, 7 inches high, 8 inches deep; with three heats, consuming 75, 150 and 300 watts respectively.

No.	A	B
For volts.....	110	220
Each	48.00	48.00

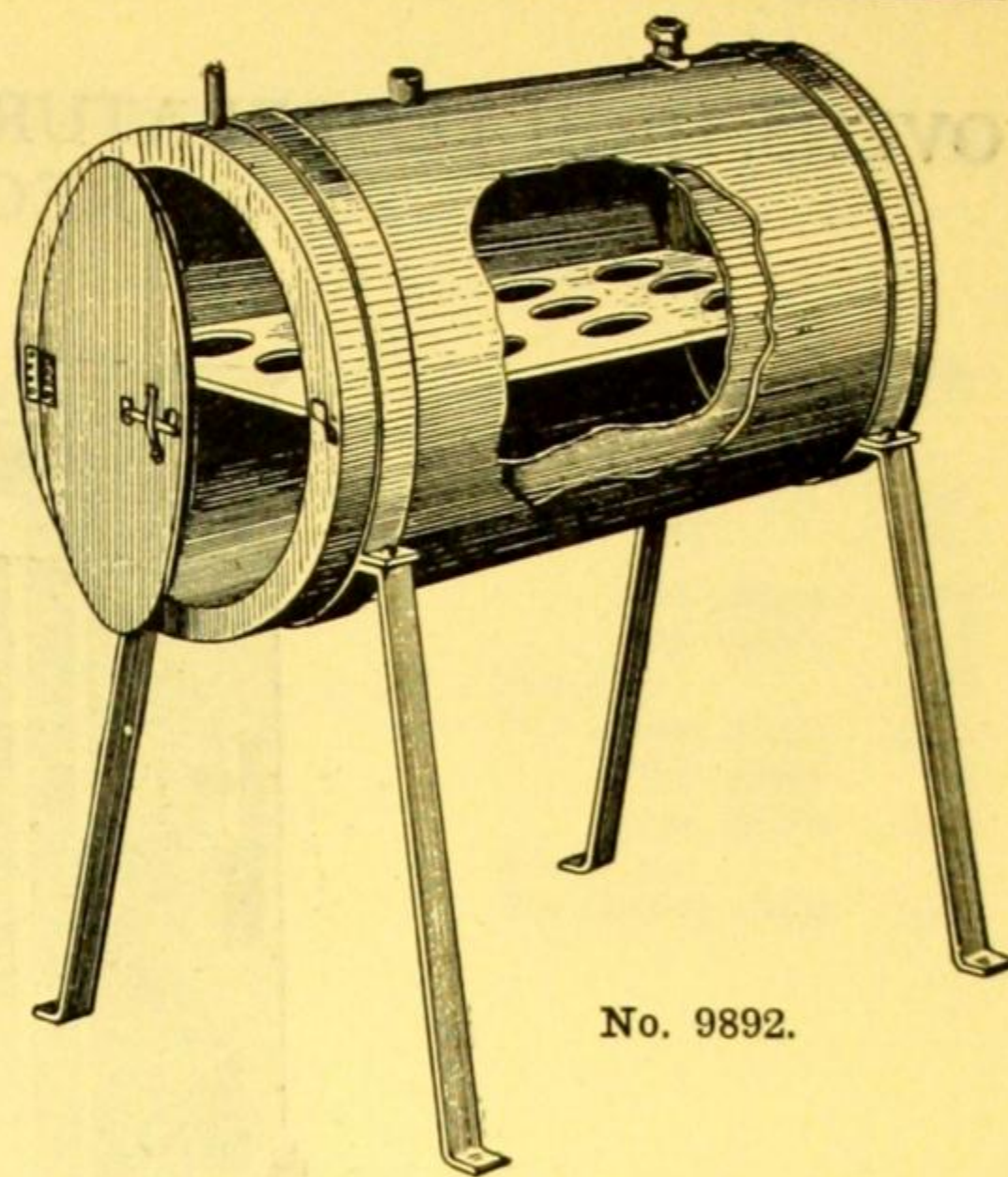
OVENS, DRYING, FOR GAS OR OIL HEAT

9880. **OVENS, Drying, Single Wall**, of heavy polished copper with tubulations for thermometer and gas regulator, mounted on heavy cast iron support with false bottom of sheet iron to protect the copper. With two removable perforated shelves. For illustration see opposite page

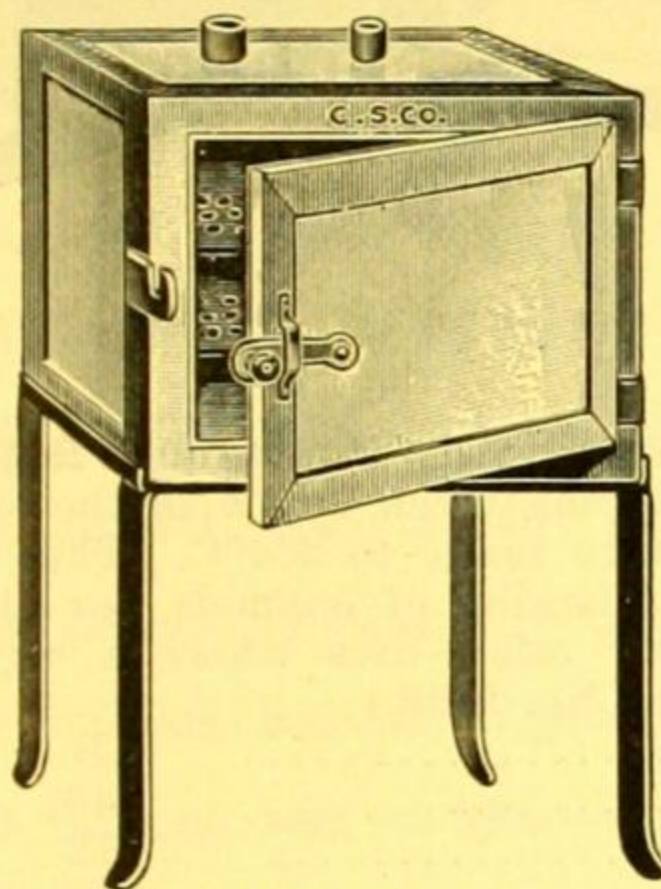
No.	A	B	C
Outside dimensions, inches.....	6x8x6	8x10x8	10x12x10
Each	8.00	10.00	13.00



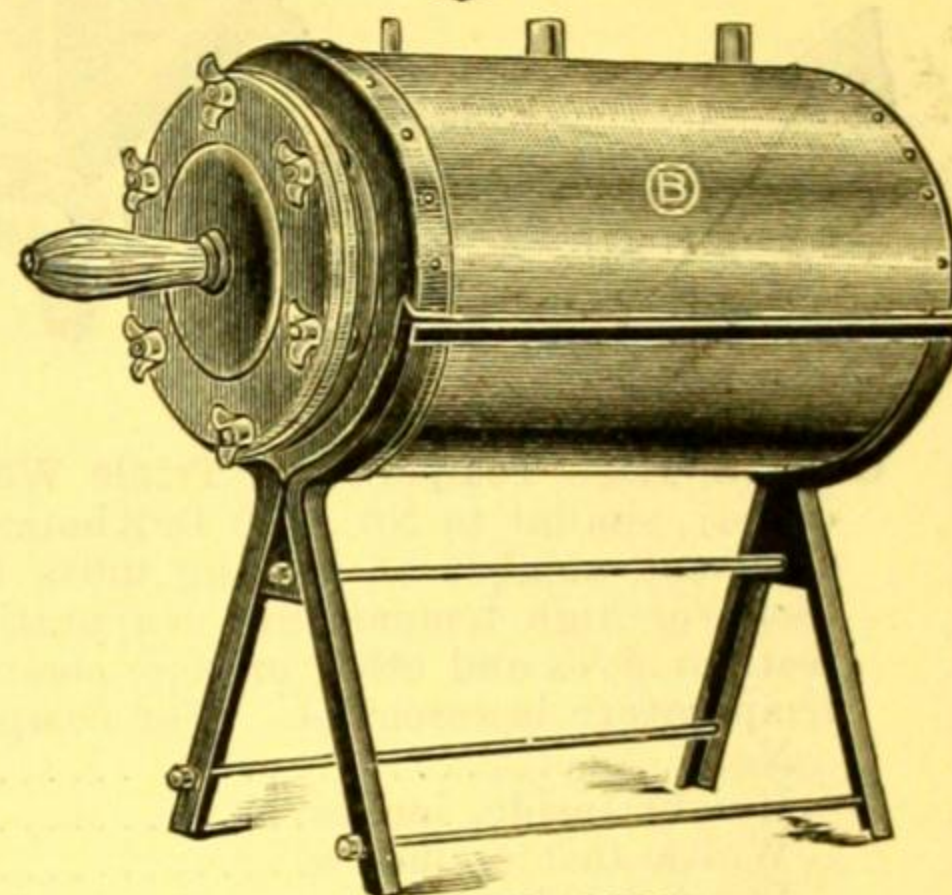
Nos. 9880 & 9884.



No. 9892.



No. 9894.



No. 9924.

9884. **OVENS, Drying, Double Wall**, same as No. 9880, but with water jacket, with tubulations for thermometer and gas regulator. With two shelves.

No.	A	B	C
Outside dimensions, inches.....	6x8x6	8x10x8	10x12x10
Inside dimensions, inches.....	4 1/4 x 6 1/4 x 5 1/4	6 1/4 x 8 1/4 x 7 1/4	8 1/4 x 10 1/4 x 9 1/4
Each	\$13.00	16.00	20.00

9892. **OVEN, Drying, Double Wall**, for moisture in coal, according to designs of the United States Bureau of Mines. Made of copper double walled, with space for a solution of glycerine in water of specific gravity 1.19 at 15°C., which will maintain a temperature of 105°C. in the oven space. The door is double walled with air space for insulation. To hasten drying, a current of air, dried by passing through concentrated sulphuric acid, and preheated by passing through a copper tube encircling the inner chamber between the walls, is forced over the samples and allowed to escape through a small opening in the door. With removable shelf perforated to take 6 No. 3166 Porcelain Capsules, openings for thermometer and gas regulator, mounted as shown. (See Technical Paper No. 8 of the United States Bureau of Mines, page 13) 30.00

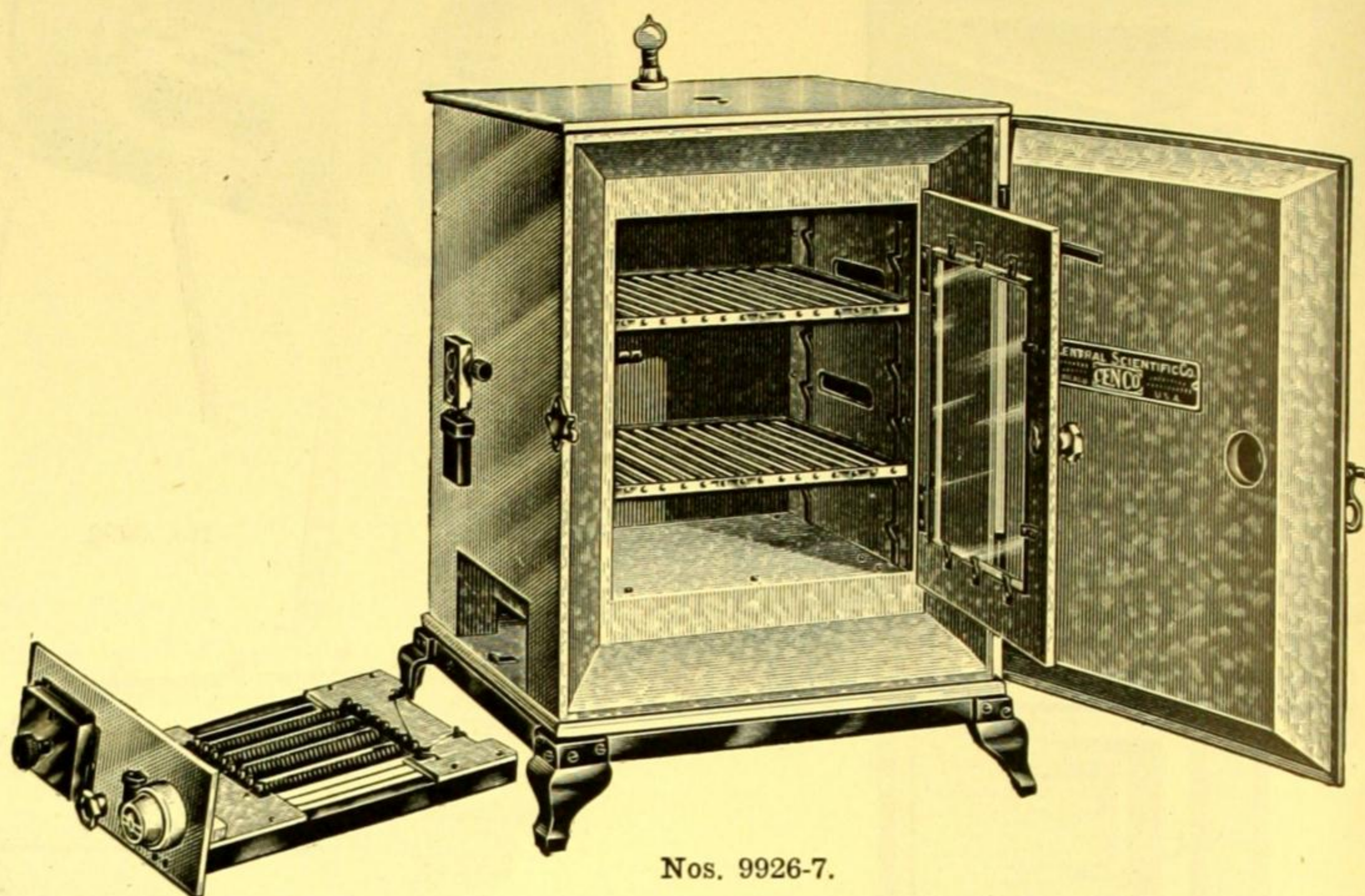
Condenser, Soxhlet, for use with Oven No. 9892, see **Condensers**.

9894. **OVEN, Drying, Single Wall**, of copper covered throughout with asbestos, as used in tar and pitch testing. Size, 8x10x8 inches..... 30.00

9924. **OVEN, Vacuum Drying, Double Wall**, used also for drying in a current of hydrogen, etc. Made of heavy copper, with flanged door held by six thumb screws and sealed with rubber gaskets. Can be used with glycerine, toluol, or water in the jacket and for vacuum up to 20 inches. Outside dimensions, 18x10 inches. Diameter inside, 6 3/4 inches; depth, 17 inches. With one shelf and with openings for vacuum connections, gage and thermometer, but without gage or thermometer 82.50

Note:—We shall be pleased to co-operate with our customers in the design and manufacture of constant temperature ovens for special purposes as we maintain a department which is devoted entirely to the development of constant temperature appliances.

OVENS, HIGH TEMPERATURE, ELECTRICALLY HEATED AND REGULATED

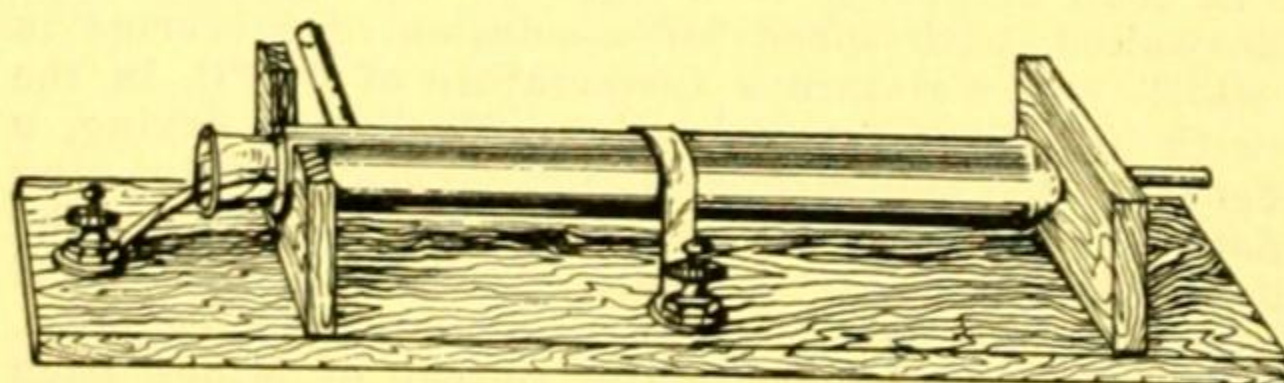


Nos. 9926-7.

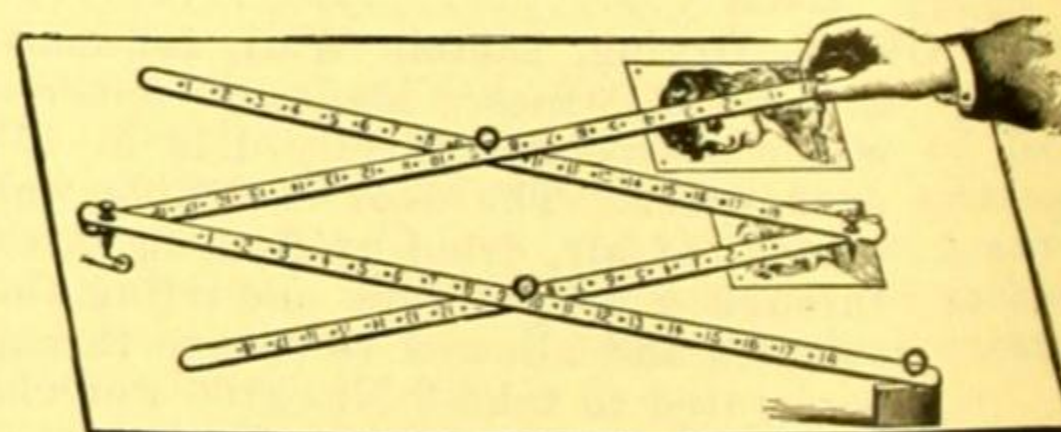
OVENS, High Temperature, Triple Wall, DeKhotinsky Electrically Heated and Regulated (patented), similar to No. 9830 DeKhotinsky Triple Wall Drying Oven but with the addition of a sufficient number of heating units to give a temperature range to 260°C. This oven can be used for high temperature evaporation and drying, for baking of enamels, for disintegration tests of dyes and other organic compounds, and for any other uses where a regulated high temperature is essential. (For complete description see No. 9830.)

No.		B	C
	Height inside, inches.....	14¾	19¾
	Width inside, inches.....	12	17
	Depth inside, inches.....	11¾	14
	Shelf space, square inches.....	282	476
9926.	For 110 volts	\$160.00	250.00
9927.	For 220 volts	160.00	250.00

OVEN, Vacuum, DeKhotinsky, Electrically Heated and Regulated, announced some time ago, was, at the time this catalog was going to press, undergoing changes in design to further improve its performance. Announcement of its completion will be made later in bulletin form together with illustration and full description.



No. 9950.



No. 9988.

- OVEN THERMOMETERS**, see general heading Thermometers.
9950. **OZONE APPARATUS, Siemens'**, for showing the formation of ozone by the discharge of an electric current. Complete with wooden support 6.25
9951. **Ozone Tube, Siemens'**, glass tube only of No. 9950, without foil..... 2.00
- PALLADIUM TUBE**, see Gas Analysis Apparatus.
- PALM GLASS**, see Pulse Glass.
- PANS, Baking**, see Flour Testing Apparatus.
- PANS, Gluten Washing**, see Flour Testing Apparatus.
9988. **PANTOGRAPH** for enlarging or reducing maps, drawings, etc. Brass mounted; black figures on highly polished hardwood; movable point. A very neat and substantial instrument. Furnished complete with pencil holder, but without drawing board 1.50

PAPER, ALL KINDS

PAPER, Adams, Fat Free, for Milk Analysis, see No. 9266.

PAPER, Asbestos, see Asbestos Paper.

9992. PAPER, Blue Print, 30 inches wide, in 10 yard rolls Per roll \$1.00

9994. PAPER, Blue Print, in light-proof packages of 24 sheets.

Size, inches	4x5	5x7	8x10
Per package	.20	.25	.40

9996. PAPER, Cochineal, in sheets 8x10 inches..... Per sheet .09

Per quire 1.00

9997. PAPER, Cochineal, in glass vials containing 100 strips Per vial .15

Per dozen vials 1.00

10000. PAPER, Congo Red, in sheets 8x10 inches..... Per sheet .09

Per quire 1.00

10002. PAPER, Congo Red, in glass vials containing 100 strips..... Per vial .15

Per dozen vials 1.00

PAPER, Cross Section, see Cross Section Paper.

PAPER, Drawing, see Drawing Paper.

PAPER, Emery, see Emery Paper.

PAPER, Filter, all kinds, see Filter Paper.

10004. PAPER, Glazed, for collecting filter ashes, etc., in sheets 20x24 inches.

No.	A	B
Color	black	white
Per quire	.90	.75

10006. PAPER, Lead Acetate, in sheets 8x10 inches Per sheet .29

Per quire 1.00

10007. PAPER, Lead Acetate, in glass vials containing 100 strips..... Per vial .15

Per dozen vials 1.00

10008. PAPER, Litmus, blue, in sheets 8x10 inches..... Per sheet .08

Per quire .90

10012. PAPER, Litmus, blue, in glass vials containing 100 strips..... Per vial .10

Per dozen vials .90

10016. PAPER, Litmus, neutral, in sheets 8x10 inches Per sheet .08

Per quire .90

10020. PAPER, Litmus, neutral, in glass vials containing 100 strips..... Per vial .10

Per dozen vials .90

10024. PAPER, Litmus, red, in sheets 8x10 inches..... Per sheet .08

Per quire .90

10028. PAPER, Litmus, red, in glass vials containing 100 strips..... Per vial .10

Per dozen vials .90

10034. PAPER, Methyl Orange, in sheets 8x10 inches Per sheet .10

Per quire 1.00

10035. PAPER, Methyl Orange, in glass vials containing 100 strips..... Per vial .15

Per dozen vials 1.00

10036. PAPER, Paraffin, in sheets 12x18 inches..... Per quire .20

10040. PAPER, Parchment, vegetable, in sheets 18x24 inches Per sheet .05

Per quire .50

10042. PAPER, Parchment, genuine animal product, in sheets 17x22 inches..... Per sheet .09

Per quire 1.00

10043. PAPER, Potassium Iodide, in sheets 8x10 inches Per sheet .10

Per quire 1.00

10044. PAPER, Potassium Iodide, in glass vials containing 100 strips..... Per vial .09

Per dozen vials 1.00

10045. PAPER, Potassium Iodide-Starch, in sheets 8x10 inches Per sheet .15

Per quire 1.00

10045A. PAPER, Potassium Iodide-Starch, in glass vials containing 100 strips..... Per vial .15

Per dozen vials 1.00

10046. PAPER, Sand, in sheets 9x11 inches.

No.	00	0	1	2
Per sheet	.05	.05	.06	.07
Per quire	.45	.45	.50	.70

Per sheet .09

10048. PAPER, Starch, in sheets 8x10 inches..... Per quire 1.00

Per sheet .15

10049. PAPER, Starch, in glass vials containing 100 strips Per vial 1.00

Per dozen vials .09

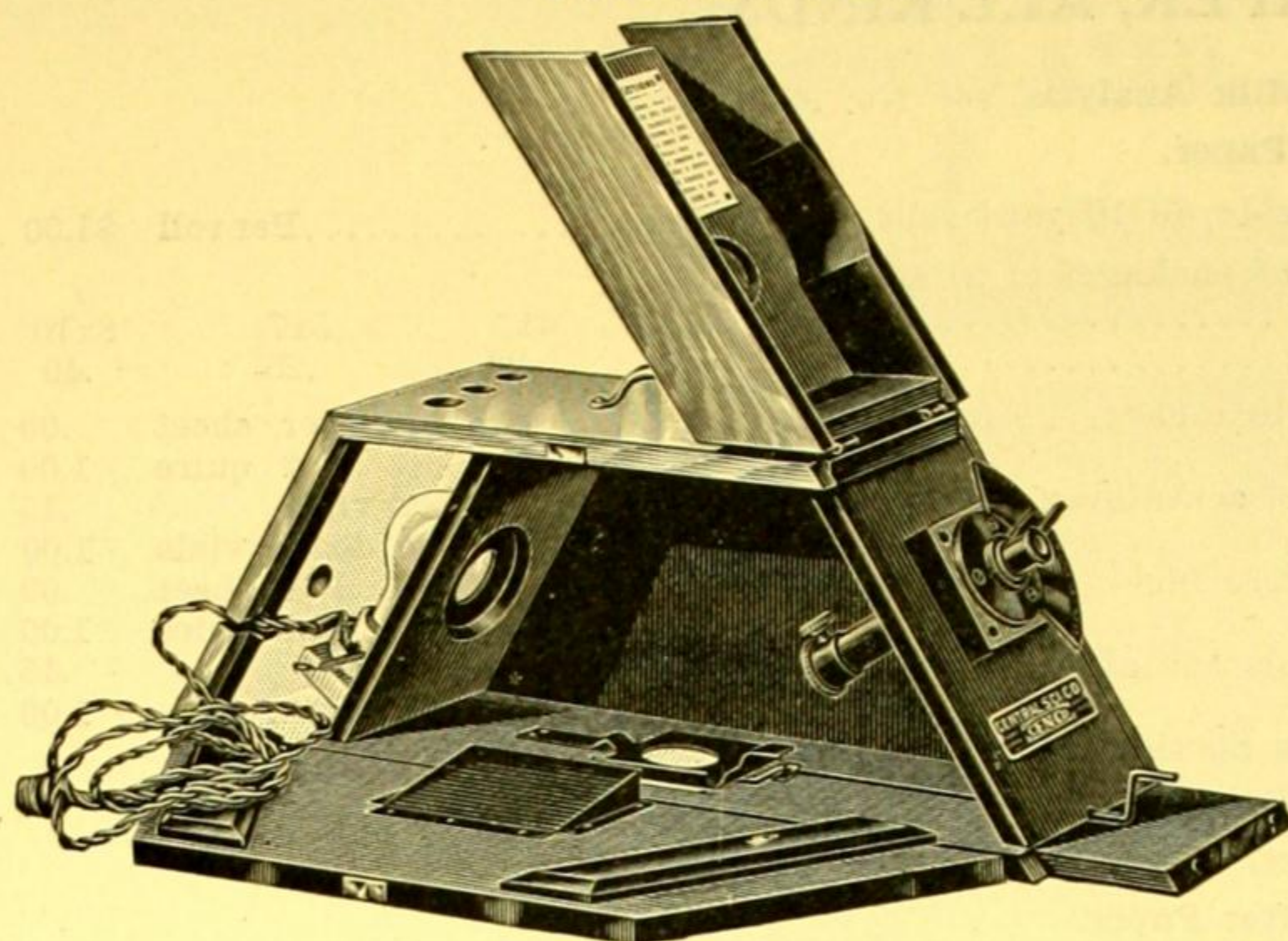
10050. PAPER, Turmeric, in sheets 8x10 inches..... Per sheet 1.00

Per quire .10

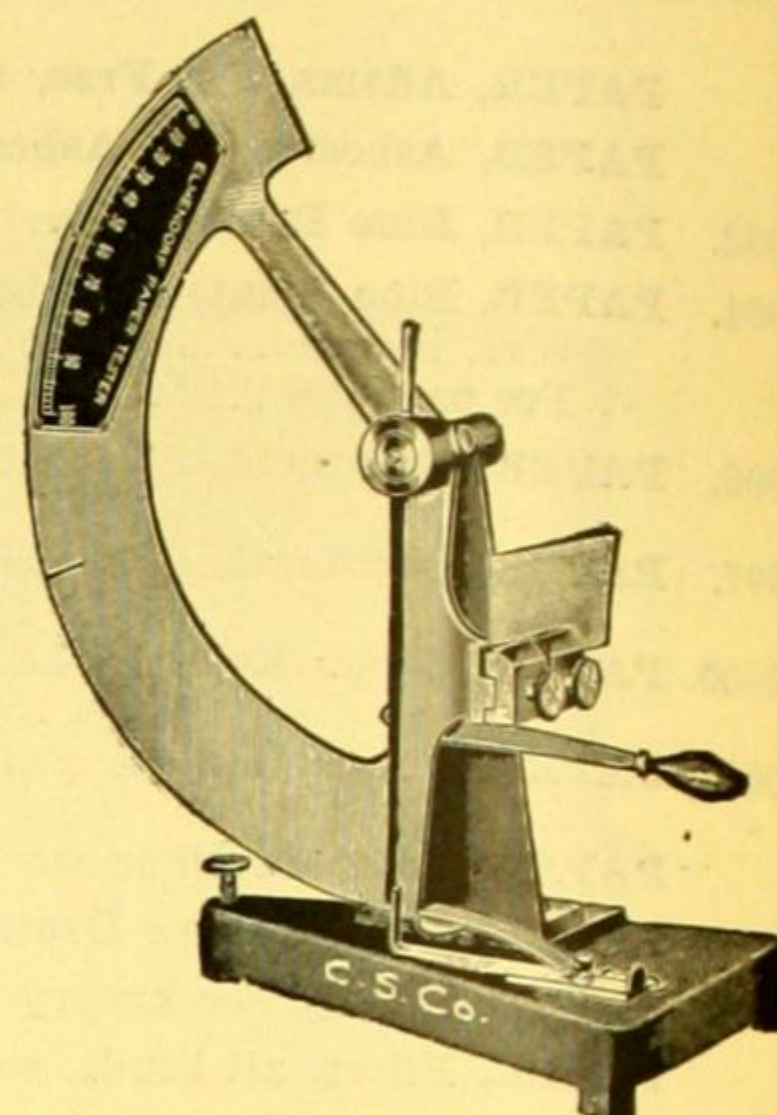
10051. PAPER, Turmeric, in glass vials containing 100 strips..... Per vial .95

Per dozen vials

PAPER TESTING APPARATUS



No. 10072.



No. 10074.

10072. **GLARIMETER**, Ingersoll, for Measuring the Surface Gloss or Degree of Finish of Paper, Leathers, Furniture and Automobile Finishes, recommended by the Paper Testing Committee of the Technical Association of the Paper and Pulp Industry. This instrument was invented by Dr. L. R. Ingersoll of the University of Wisconsin in connection with research work on paper for the United States Forest Products Laboratory and described by him first in *Electrical World*, March 21, 1914, and later in the *Journal of the Optical Society of America*, May 1921; *Paper*, February 9, 1921; and *Paper Industry*, March 1921.

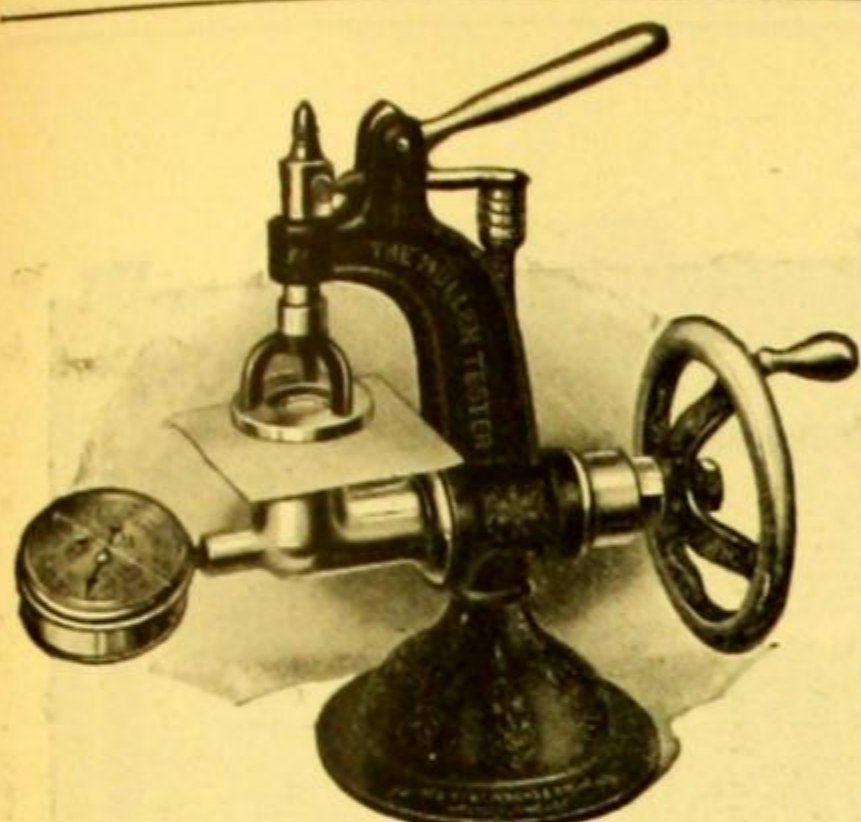
The optical parts consist of a horizontal slit upon which an eyepiece may be focussed, with a Wollaston prism and a Nicol prism between the slit and the eyepiece. These components are mounted in a single tube and the Nicol prism can be rotated, the angle of rotation being indicated on a scale of degrees, as in a polariscope. The tube is mounted with its axis approximately at the angle of maximum polarization of light reflected from the gloss surface. The source of light is an electric lamp so mounted as to be in symmetry with the optical system with respect to the small area of surface to be examined. The reflected light entering the slit if unpolarized is divided into two polarized components, slightly separated by the Wollaston prism, and these two beams produce two adjacent images of the slit in the eyepiece. If the light reflected from the surface of a sample of paper is partially polarized, the two beams coming through the Wollaston prism will be of unequal brightness. By rotating the Nicol, a brightness match can be quickly established, and the angular position for equality read on the scale. For each degree of gloss of the surface there corresponds a particular setting of the Nicol prism, and each setting, therefore, has a definite meaning as regards the surface of the paper.

The instrument is so constructed that the samples of paper or other material can be introduced into the holder in line with the optical system, through a small door, so that the operator need not move from his position at the eyepiece. Readings can be accurately and quickly made in an ordinarily lighted room. Any plant control or laboratory man can operate the instrument without previous experience along technical lines. The Glarimeter will enable the paper-maker to standardize the finishes of white or colored supercalendered, coated, machine finish, photographic or other stock with precision. It will also enable the paper buyer to specify the degree of finish he desires on any type of stock, thus giving him an automatic control over opacity and color (elimination of dark color caused by sacrificing color for gloss by over-calendering).

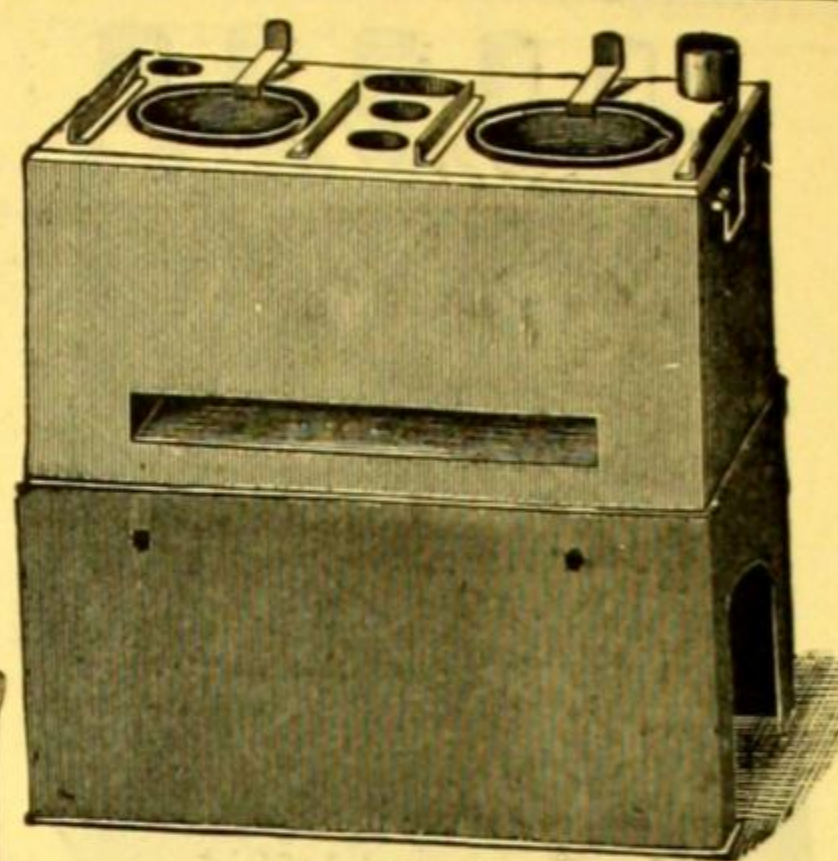
Glarimeter as described, with electric bulb, red glass plate to use as color filter for colored products, ground glass plate for reducing the intensity of light when working with highly glossed stock, and connecting cord and plug..... \$200.00

(For more detailed description send for Bulletin No. 100.)

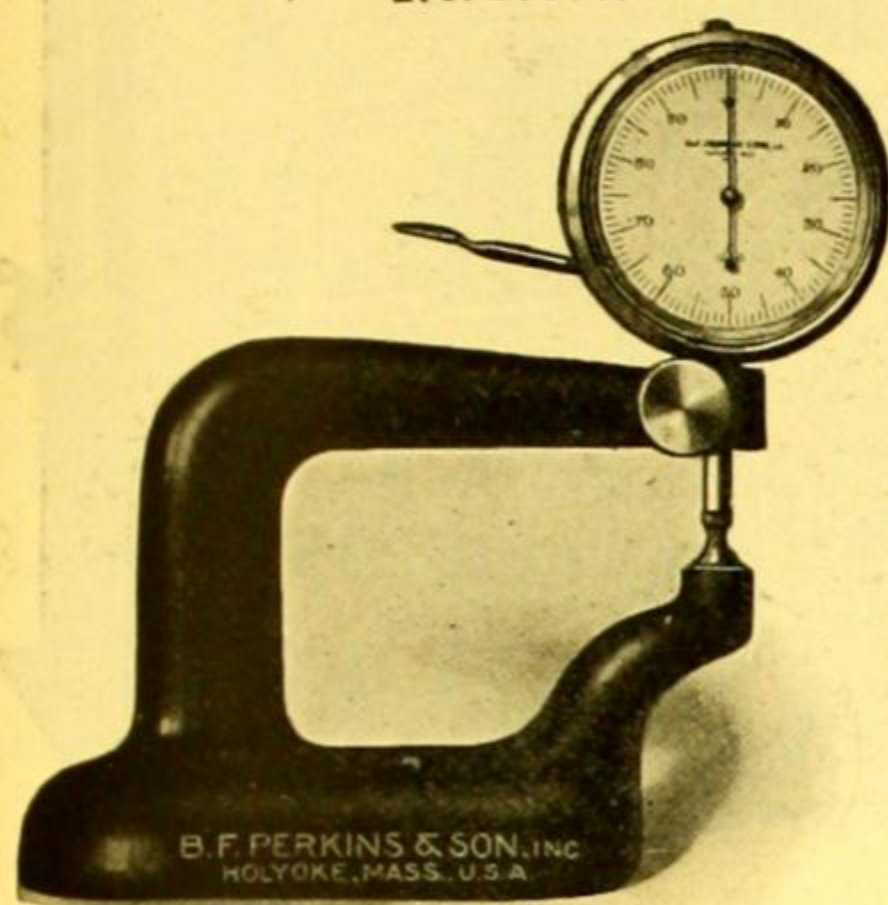
10074. **PAPER TEARING TESTER**, Elmendorf, for accurately measuring in grams the resistance of paper to tearing, designed by Armin Elmendorf of the United States Forest Products Laboratory. The machine consists of a heavy pendulum or sector, mounted on ball bearings, carrying a clamp to hold the paper sample, and provided with a dial graduated from 0 to 100. On the pendulum axis is mounted a pointer, which has a constant friction, just sufficient to stop at the highest point reached by the swing of the sector. The instrument is so calibrated that by multiplying the dial readings by the base number of sheets (16), readings may be reduced to grams. As described..... 130.00



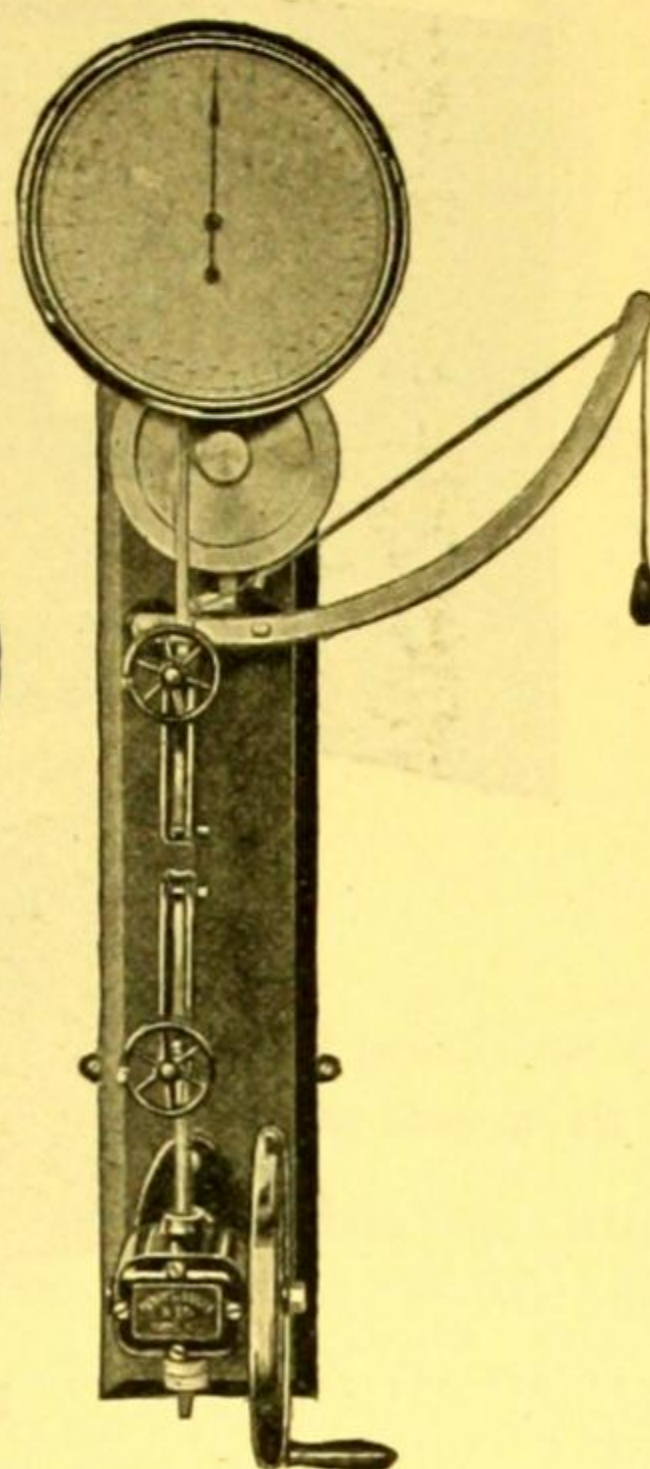
No. 10076.



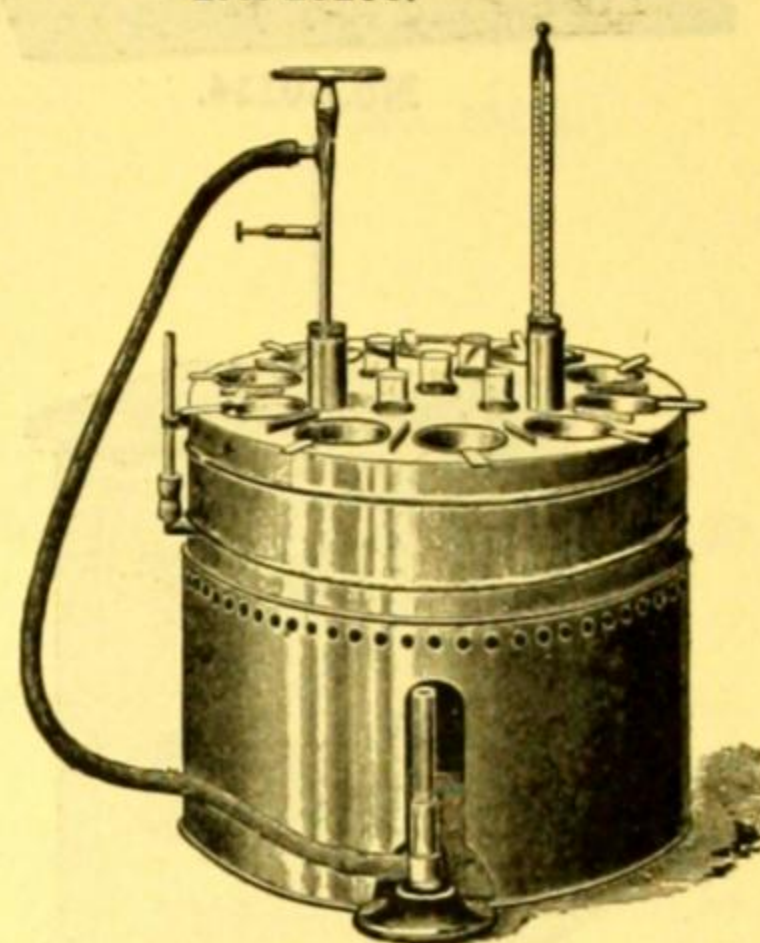
No. 10100.



No. 10084.



No. 10078.



No. 10102.

10076. **PAPER TESTER**, Mullen, for measuring the bursting strength of paper, cardboard, textiles, etc. By turning the hand wheel, the fluid pressure is applied upon a circular area of 1 square inch, and the pressure required to burst the paper is registered upon the gage in pounds per square inch. A rubber diaphragm prevents the fluid from wetting the paper. This test is required upon all paper purchased by the United States Government.....\$125.00

10078. **PAPER TESTING MACHINES**, Hand Operated, for Tensile Strength, Breaking Test after Folding and Tearing Strength of Paper. Originally designed as a cloth tester, but provided with flat grips to take paper samples. The tester is constructed on the dead weight or pendulum principle, without springs or delicate parts to wear out or cause trouble. The pull is registered automatically by the pointer on the dial until reset by the operator. Mounted on oak back board with iron brackets for attachment to wall. Total length of machine, about 4 feet.

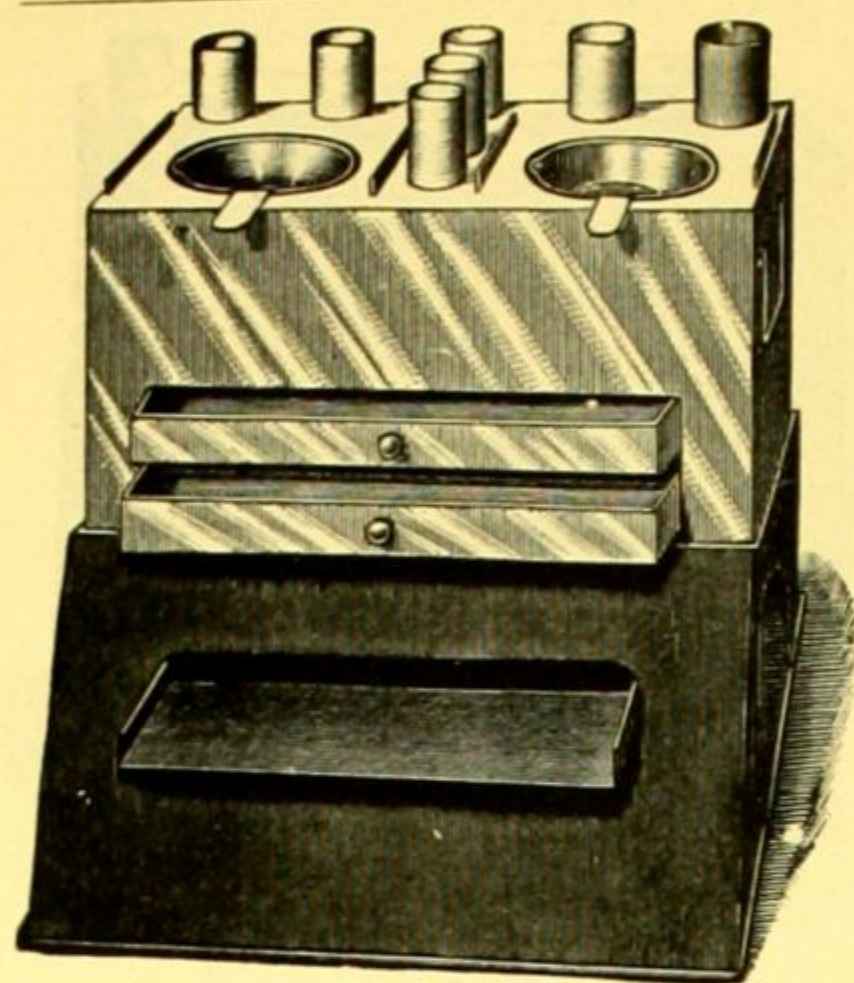
Capacity, pounds	100	150	200	250
Each (F. O. B. Factory)	125.00	130.00	135.00	145.00

10084. **PAPER THICKNESS GAGE**, standard, for use with any paper from tissue to heaviest cardboard. Reads thickness direct upon dial in thousandths of an inch, up to 0.3 inch, without danger of error..... 45.00

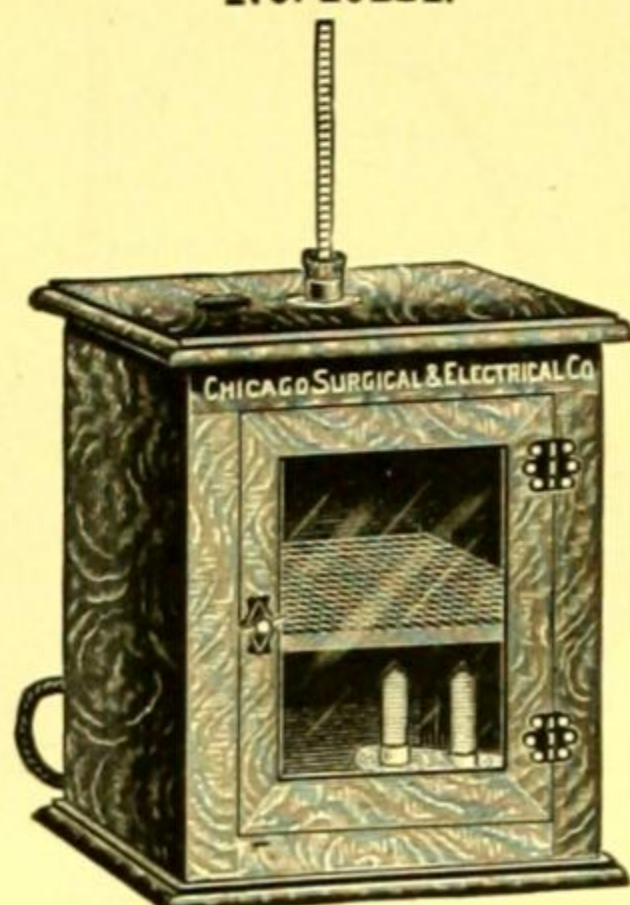
PARAFFINE BATHS AND OVENS

10100. **PARAFFINE BATH**, simple form, made of polished copper, 7 inches long, $3\frac{3}{4}$ inches wide, and $3\frac{1}{2}$ inches deep, with extra sheet iron bottom and iron base 5 inches high. It is provided with a space for heating slides, and two nickel-plated cups. The shallow cup is $2\frac{1}{8}$ inches in diameter and $\frac{3}{4}$ inch deep, watch glass shape, and the deep one is $2\frac{1}{8}$ inches in diameter and $1\frac{1}{2}$ inches deep. With tubulations for thermometer, gas regulator and for three test tubes. Without burner, thermometer or regulator..... 12.00

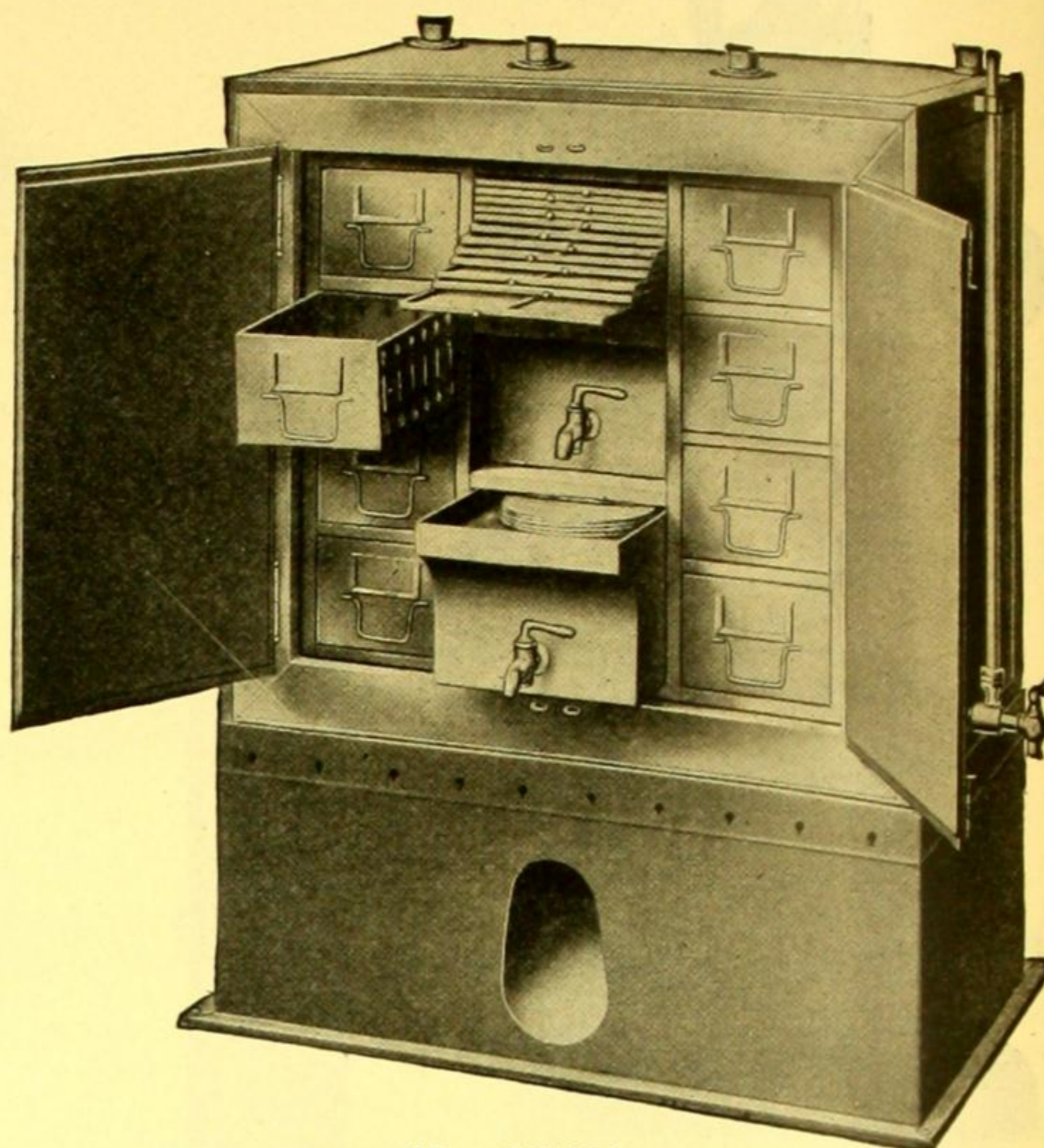
10102. **PARAFFINE BATH**, round form, of polished copper, $12\frac{1}{2}$ inches in diameter, $3\frac{1}{2}$ inches deep, with sheet iron base, $7\frac{1}{2}$ inches high. There are ten cups, seven of deep form, $2\frac{1}{8}$ inches in diameter and $1\frac{1}{2}$ inches deep, and three shallow, $2\frac{1}{8}$ inches in diameter and $\frac{3}{4}$ inch deep, watch glass shape. With five tubulations in the top for glass tubes, and tubulations for thermometer and gas regulator. Without burner, thermometer or regulator..... 32.00



No. 10114.



No. 10122 (Size 3P).



Nos. 10136-9.

10114. **PARAFFINE BATH**, Miller, of polished copper, 8 inches long, 4 inches wide and 4 inches deep, provided with an extra sheet iron bottom to prevent burning out, and an iron base 5 inches high. The bath has two nickel-plated cups, one shallow and one deep. The shallow cup is $2\frac{1}{8}$ inches in diameter and $\frac{3}{4}$ inch deep, watch glass shape, and the deep one is $2\frac{1}{8}$ inches in diameter and $1\frac{1}{2}$ inches deep. Complete with two drawers to hold slides, and with tubulations for thermometer, gas regulator and for five test tubes, but without burner, thermometer or regulator \$22.50

PARAFFINE EMBEDDING OVENS, simple form, see **Drying Ovens** Nos. 9880-84.

PARAFFINE EMBEDDING OVENS, DeKhotinsky Electrically Heated and Regulated, see **Incubators** Nos. 7890 to 7900.

PARAFFINE EMBEDDING OVENS, Wood Frame, Electrically Heated and Regulated, of same construction as No. 7908 Incubators, but with thermostat adjusted and tested at 56°C . before shipment. For full description see No. 7908.

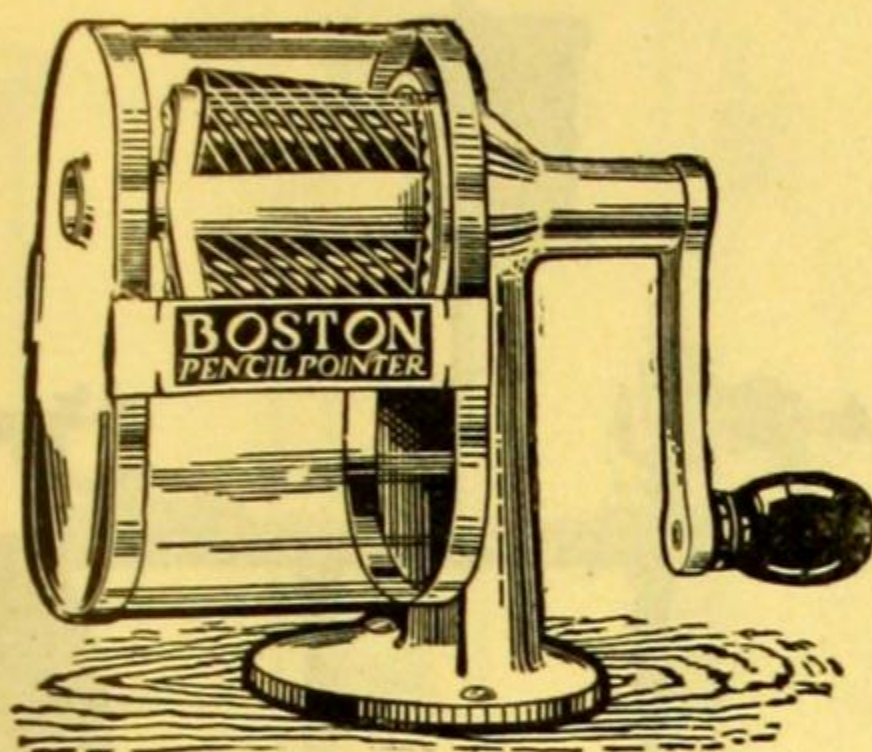
No.	2P	3P	11P	31P	32P	41P
Height inside, inches.....	26	12	15	30	26	30
Width inside, inches.....	18	9	12	20	18	20
Depth inside, inches.....	18	9	$10\frac{1}{2}$	18	18	18
Number of shelves.....	1	1	1	3	1	3
Doors	double	single	double	double	double	double
Height of stand, inches.....	.....	.....	.....	.....	32	32
Shipping weight, pounds.....	145	22	38	175	180	220
10122. For 110 volts	106.50	43.00	69.00	130.00	119.00	142.50
10123. For 220 volts	106.50	43.00	69.00	130.00	119.00	142.50

PARAFFINE EMBEDDING OVEN, Lillie's Improved, similar in construction to No. 10130. but provided with 8 drawers and 2 receptacles with screw tops and stop-cocks to enable the contents to be run into molds as required; with 12 perforated trays for drying and fixing purposes. Outside dimensions, 23 inches wide, 25 inches high, and $15\frac{1}{2}$ inches deep, with enclosed sheet iron base 15 inches high.

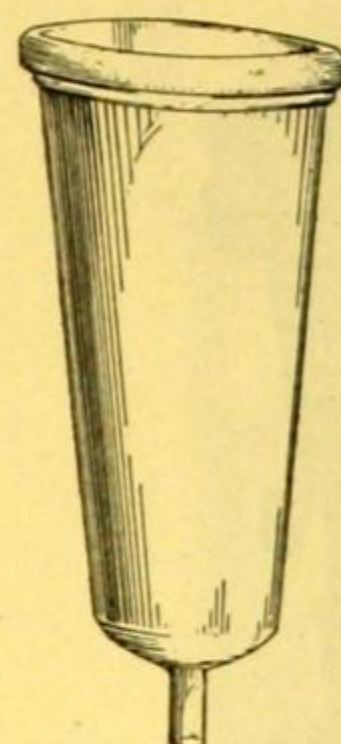
10136.	Without heater.....	272.00
10137.	With gas heater.....	287.00
10139.	With electric heater.....	315.00

PARAFFINE EMBEDDING BOX, see No. 8934.

PARAFFINE EMBEDDING TABLE, see No. 8936.



No. 10164.



No. 10170.



No. 10174.

PARR CALORIMETER, see Calorimeters.

PASTILLE PRESS, see No. 2400.

10156. PENCIL, Litmus, made like an ordinary lead pencil, one end blue, the other end red.... \$0.30
10% discount in lots of 12.

10160. PENCILS, Wax, for writing on glass, porcelain, etc. Also used for skin marking for physiological and anatomical purposes.

No.	A	B	C
Color	blue	red	yellow
Each	.15	.15	.15

10% discount in lots of 12.

10162. PENCILS, Wax Crayons, for marking on glass, porcelain, alundum, etc. Need no sharpening and the marks do not run when heated. The blue burns to an indelible mark on porcelain.

No.	A	B	C
Color	black	blue	red
Each	.10	.10	.10
Per dozen	1.00	1.00	1.00

10164. PENCIL SHARPENER, Boston. Simple and durable, for standard size pencils. Celluloid box holds dust and shavings. New cutters readily inserted 1.00

10170. PERCOLATORS, conical, heavy glass.

Capacity, pints	1	2
Each	.80	1.10
Capacity, gallons	$\frac{1}{2}$	1
Each	1.25	1.70
Each	1.25	1.70
Each	1.25	1.70

10174. PERCOLATORS, Oldberg's, heavy glass, narrow form, almost cylindrical.

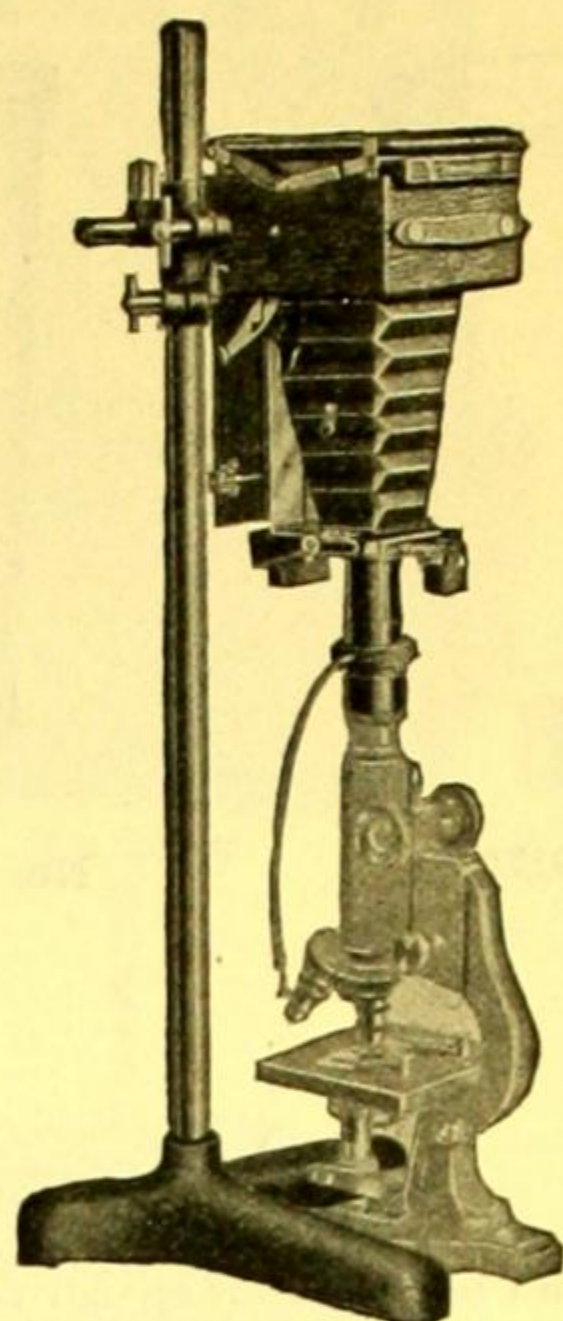
Capacity, pints	$\frac{1}{2}$	1	2
Each	.80	1.00	1.20
Capacity, gallons	$\frac{1}{2}$	1	2
Each	1.80	3.00	3.00

PETRI DISHES, see Culture Dishes.

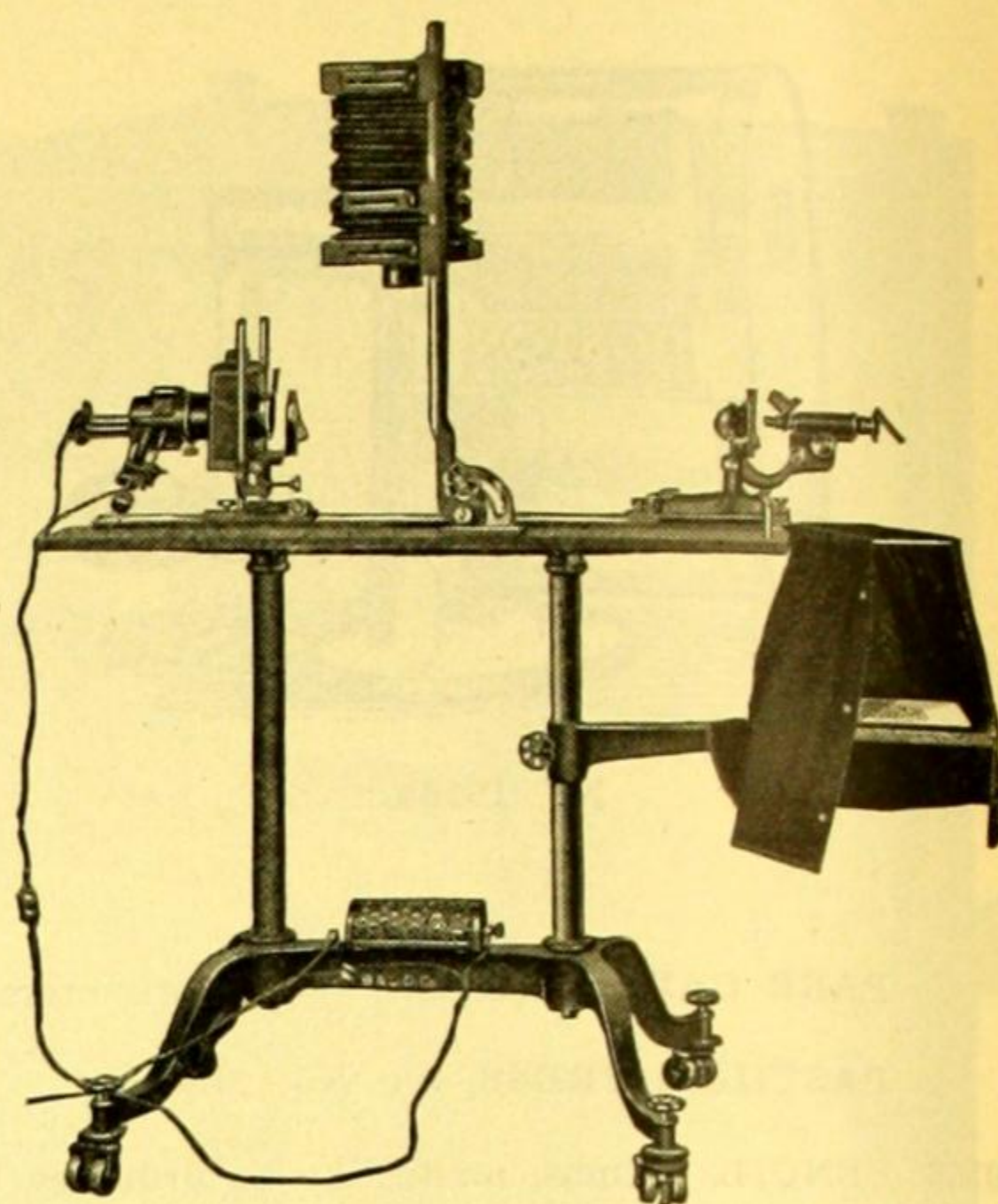
PHOSPHORUS TUBE, Goetz's, see Centrifuges and Accessories.

PHOTOMETERS, see Gas Analysis Apparatus.

PHOTOMETERS, Parr's Sulphur, see Nos. 2378 and 2380.



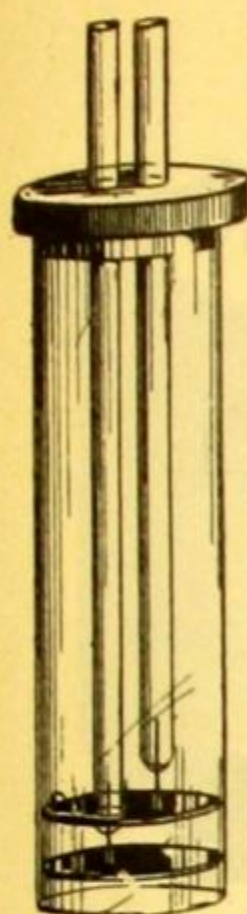
No. 10180.



No. 10188.

PHOTO-MICROGRAPHIC APPARATUS

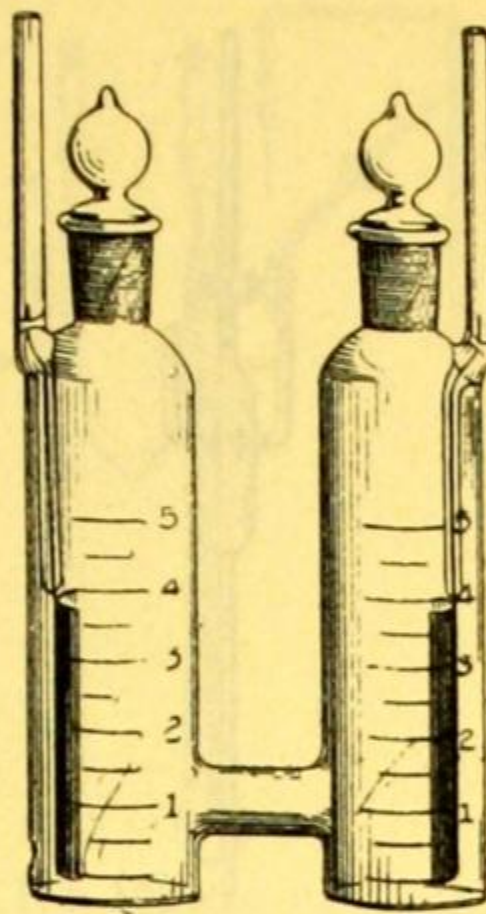
10180. **PHOTO-MICROGRAPHIC APPARATUS**, Wilson, for photographing specimens under the microscope without the necessity of removing the specimen to a special apparatus which may cause considerable inconvenience in locating the particular object of interest. Consists of a modified hand camera taking plates $3\frac{1}{4}$ by $4\frac{1}{4}$ inches, supported on a rigid upright rod which in turn is supported on a heavy cast-iron base. Between the two longer feet of this base are adjustable stops which may be adjusted to any microscope to always bring it to the same position. The camera may be rotated in any position through 360° in a vertical and horizontal plane. This makes it available for copying or ordinary photography. In addition to the special adapters and extensions, an excellent rapid rectilinear lens and automatic shutter are supplied. With one plate holder..... \$100.00
10181. **Plate Holder**, for use with No. 10180 Photo-micrographic apparatus 2.00
10188. **PHOTO-MICROGRAPHIC APPARATUS**, Type LD, arranged so that it may be used for photo-micrography with the microscope either in a horizontal or vertical position, also for drawing by directing the image on a horizontal drawing board by means of a reflecting mirror placed over the eyepiece. It is very rigidly constructed and will be found most satisfactory for general laboratory work.
- Supporting Stand**—Of cast iron; feet of stand have lateral spread of 25 in.; base plate, carrying camera bed and optical bed for illuminating accessories and microscope plate is 45×7 in. and 39 in. from the floor.
- Illuminating System**—Consists of a 5-ampere, 90° hand feed arc lamp with rheostat for 110 volts; aspheric condenser in focusing mount; support for ray filter; one ground glass, one blue glass and one green glass filter. All of these parts are mounted on a support adjustable for height and with micrometer adjustment for vertical and lateral adjustment.
- Microscope Plate**—Attached to optical bed by means of clamps so that the microscope may be moved along the optical bed to bring it to the desired location either for drawing or for connection with the camera.
- Camera**—Optical bed 25 in. long, graduated to 60 cm with inclination joint; wooden frames, bellows, ground-glass and one double plate holder for 5×7 -in. plates; wooden frames attached to two supports on optical bed, upon which they are adjustable to bring center of camera into alignment with microscope; front board of camera fitted with automatic shutter and light-tight connector for microscope.
- Drawing Board**—Of wood, neatly finished, 14 in. square; adjustable on front standard of supporting stand, which is graduated so that one can readily reset the board at any particular position; supplied with velvet hood on adjustable standard to shield board from light when desired.
- Complete as described, with arc lamp illuminator 285.00
10189. **Plate Holder**, for use with No. 10188 Photo-Micrographic apparatus 2.00
- Prices on Nos. 10180 and 10188 subject to 10% discount to hospitals and educational institutions.



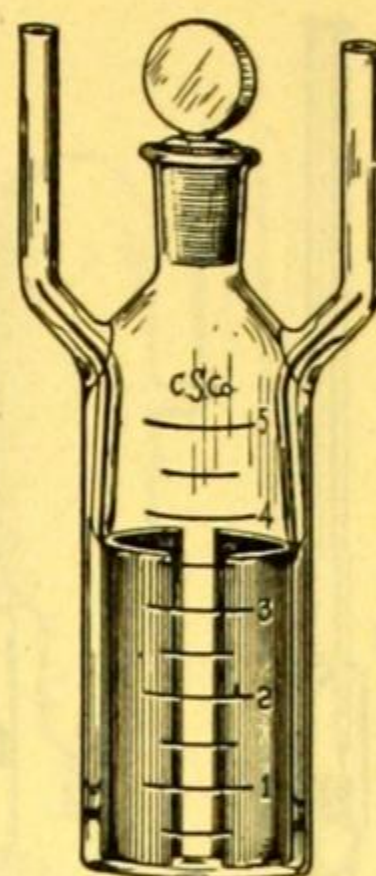
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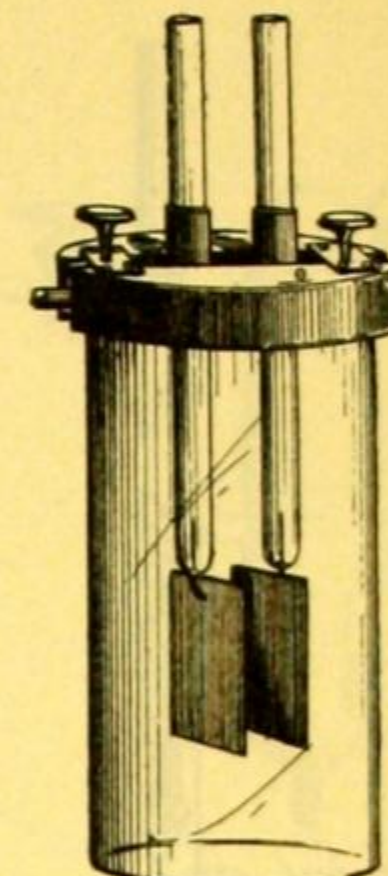
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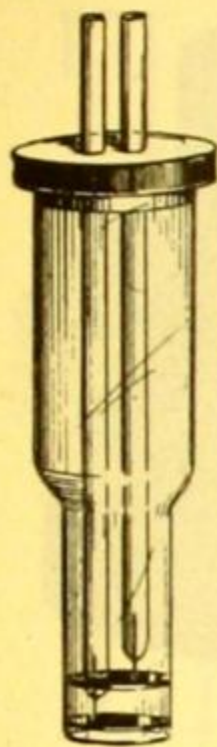
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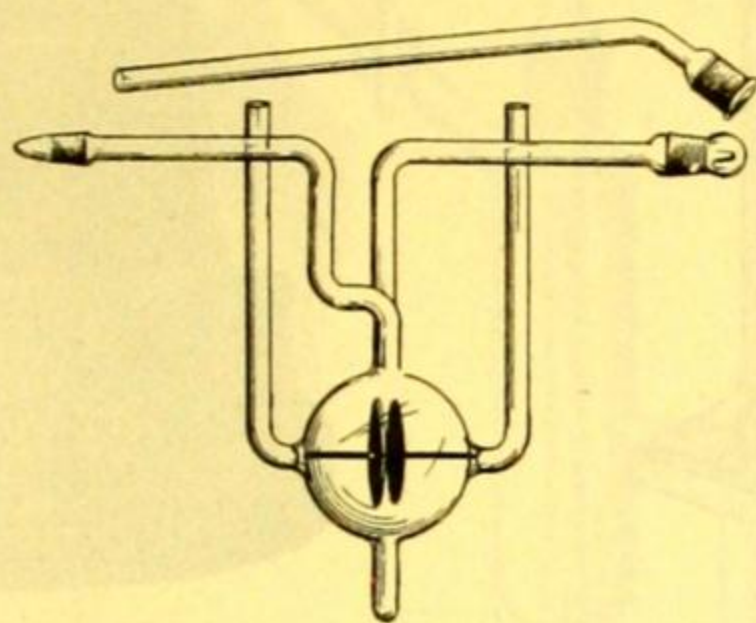
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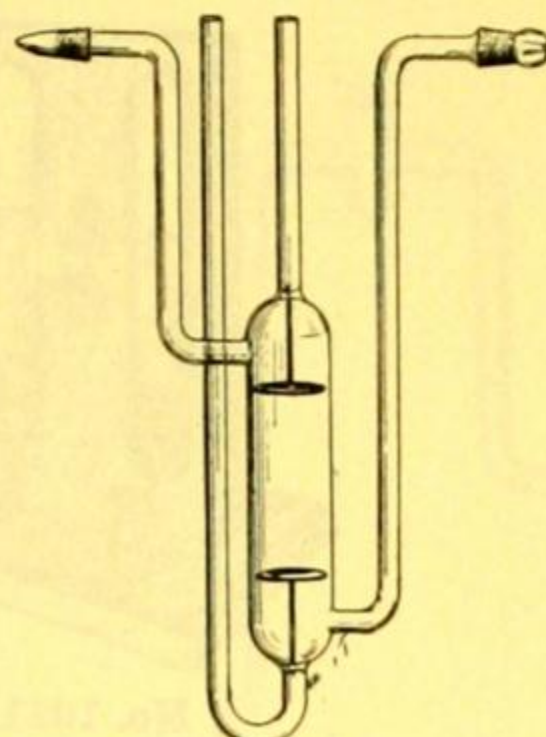
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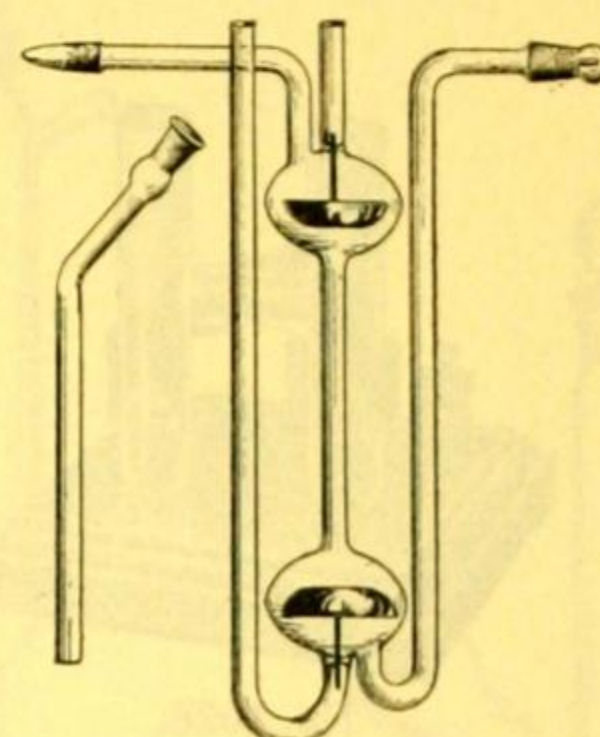
No. 10234.



No. 10236A.



No. 10236B.



No. 10236C.

PHYSICAL CHEMISTRY APPARATUS

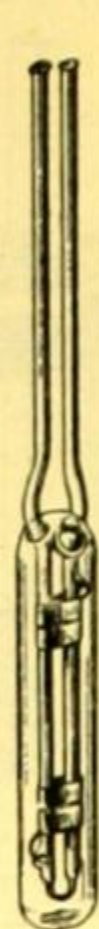
BATTERY CELLS, all kinds, see general heading **Batteries**.

BRIDGE, Conductivity, see No. 10436.

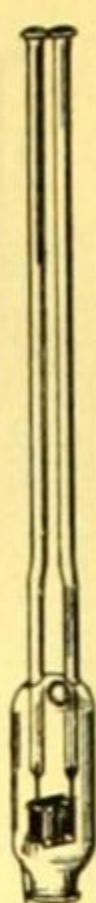
BRIDGES, Wheatstone, see **Electrical Apparatus**; also page 404.

CALORIMETERS, see general heading **Calorimeters**; also page 404.

10210. **CELL**, Conductivity, Arrhenius, for poorly conducting liquids, with electrodes of platinum 24 mm in diameter, held 10 mm apart. Weight of platinum, about 5.1 grams. With hard rubber cap \$33.00
10211. Glass Cell only of No. 10210 1.75
10212. **CELL**, Conductivity, Freas, for good conductors, consisting of two heavy platinum electrodes, each one centimeter square, held rigidly in place by means of four small glass rods fused to the electrodes. This construction prevents changes in the cell constant through jarring or rough handling. Weight of platinum, about 0.55 gram 12.00
10214. **CELL**, Conductivity, Kohlrausch, for good conductors, consisting of two cylinders graduated in $\frac{1}{2}$ cm divisions joined together, with large fused-in platinum electrodes and ground glass stoppers. Weight of platinum, about 4.4 grams 33.50
10226. **CELL**, Conductivity, Kohlrausch, for poorly conducting liquids, with large, securely fused-in platinum electrodes. Weight of platinum, about 4.4 grams. With ground glass stopper and glass cell graduated in $\frac{1}{2}$ cm divisions 33.50
10230. **CELL**, Conductivity, Kohlrausch-Holborn, for poorly conducting liquids, with vertical electrodes supported in adjustable rubber cap so that the distance apart may be changed as desired. Weight of platinum, about 4.2 grams 29.25
10231. Glass Cell only of No. 10230 1.00
10234. **CELL**, Conductivity, Ostwald, for poorly conducting liquids, with platinum electrodes 15 mm in diameter, held 20 mm apart. Weight of platinum, about 1.9 grams. With hard rubber cap 15.50
10235. Glass Cell only of No. 10234 2.25
10236. **CELLS**, Conductivity, Washburn, a series of three cells carefully made with the purest materials and capable of measuring conductivities ranging from 2×10^{-7} to 1 ohm or reciprocal ohm. (See Journal of Amer. Chem. Soc., Vol. XXXVIII, 1916, page 2449.)
- | | A | B | C |
|--|---------------------------------|--|----------------|
| No. | 10^{-5} to 2×10^{-7} | 3×10^{-2} to 3×10^{-5} | 1 to 10^{-2} |
| Range in mhos. | 11.00 | 4.25 | 12.00 |
| Weight of platinum, gms. | 18.00 | 16.00 | 20.00 |
| Each (price of platinum not included) | | | |



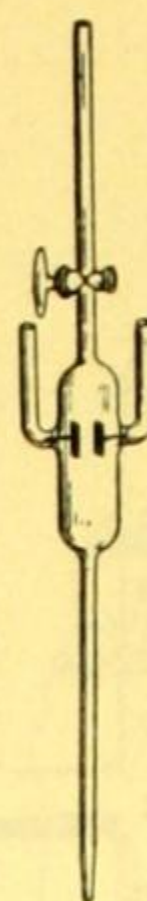
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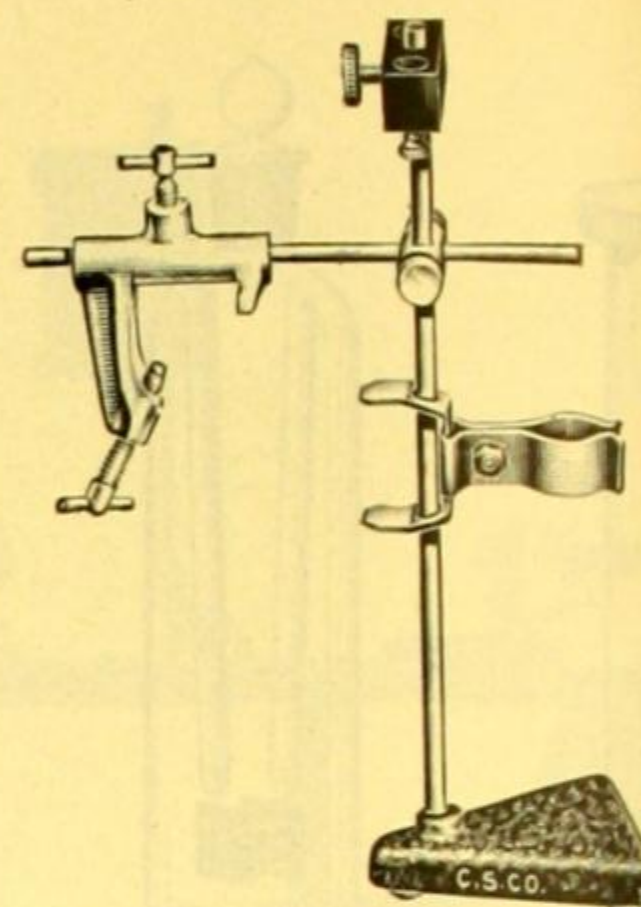
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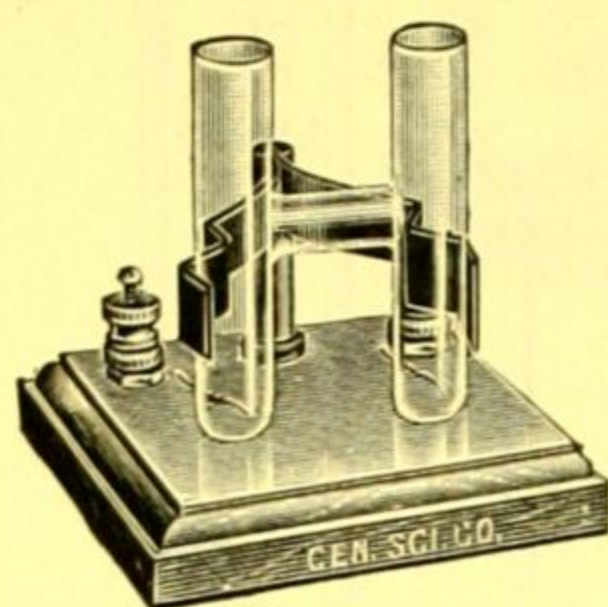
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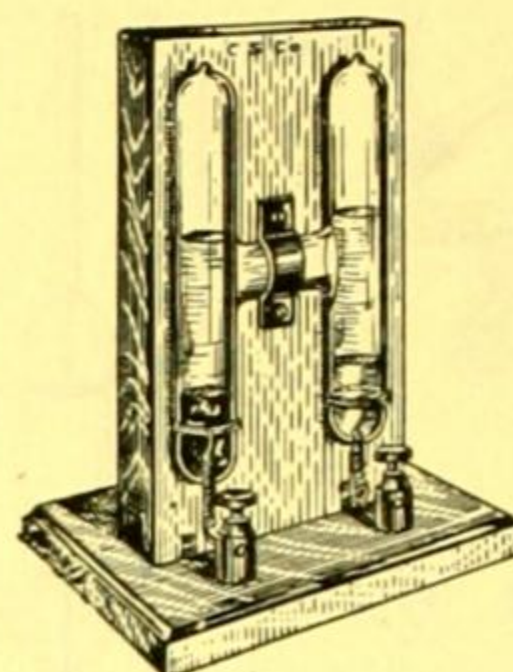
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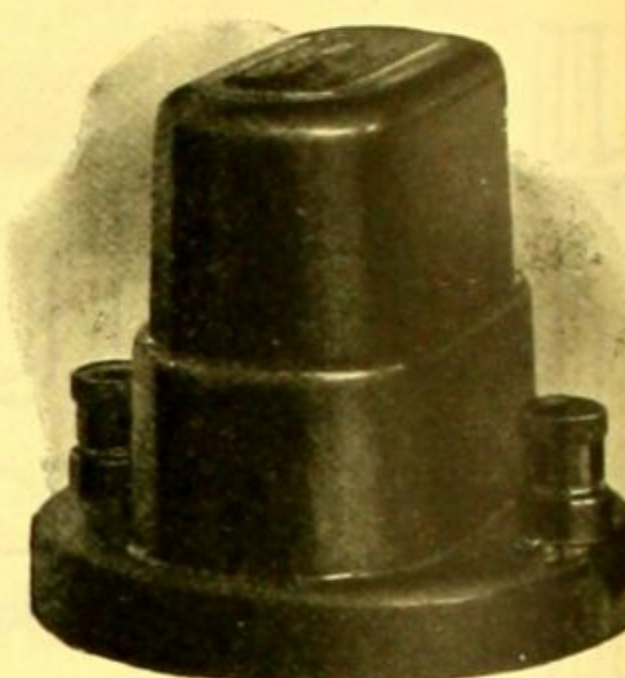
No. 10238.



No. 1028.



No. 1031.



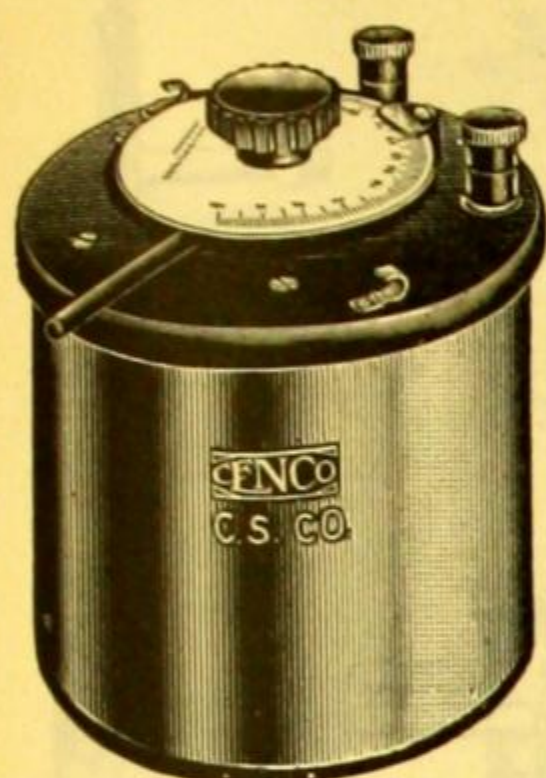
No. 1032.

- 10237A. **CELL, Conductivity, Dipping Electrode**, for good conductors, for immersion in liquids to be tested; in protecting cylinder, with platinum electrodes. Weight of platinum, about 1.3 grams. \$15.00
- 10237B. **CELL, Conductivity, Dipping Electrode**, for poor conductors, with parallel platinum electrodes. Weight of platinum, about 1.2 grams. 15.00
- 10237C. **CELL, Conductivity, Dipping Electrode**, for poor conductors, similar to No. 10237B, but of larger capacity. Weight of platinum, about 0.6 gram. 15.00
- 10237D. **CELL, Conductivity, Pipette Electrode**, for poor conductors, for measuring solutions affected by the air and for measuring solutions at 100° C. With glass stop-cock. Weight of platinum, about 1.6 grams. 17.00
10238. **SUPPORT for Conductivity Cells**, consisting of heavy non-corrosive metal base and rod, with clamp for holding cells, hard rubber terminal with mercury wells and binding posts and with clamp for attachment to thermostat.

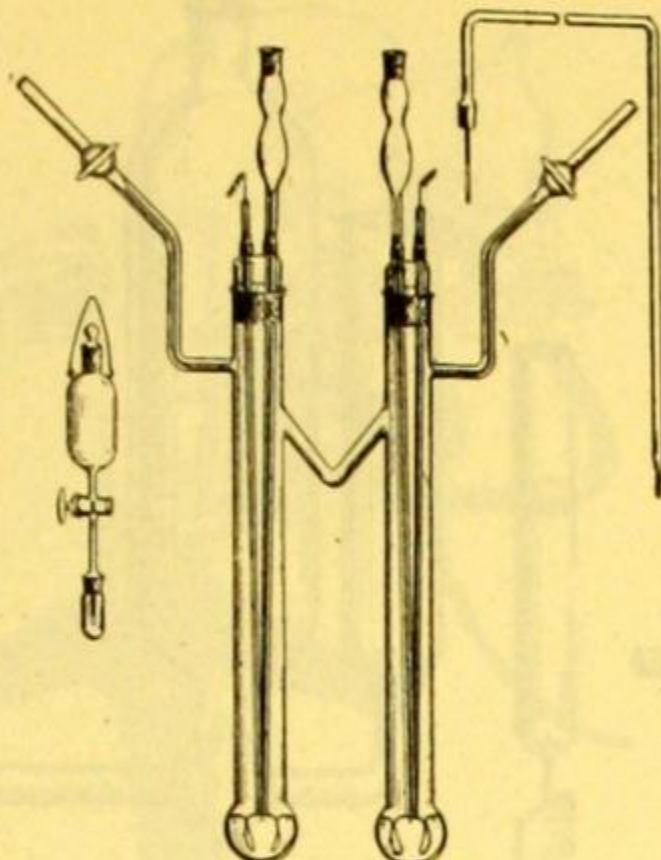
No.	A	B	D	E	F
For Cell No.	10210	10214	10226	10230	10234
Each	9.00	9.00	9.00	9.00	9.00

STANDARD CELLS

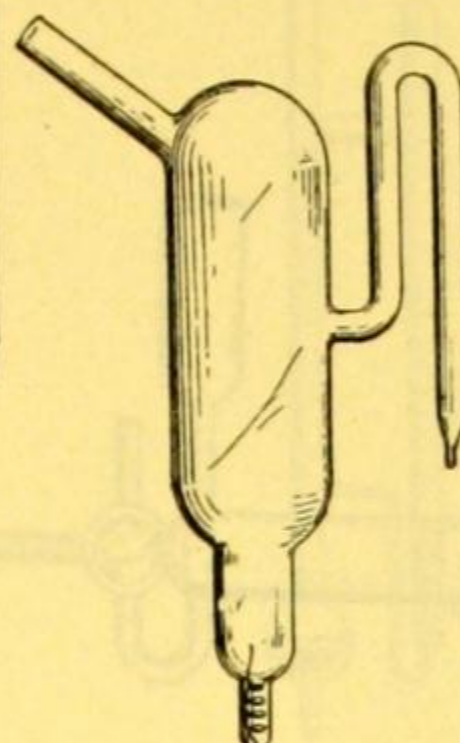
1026. **CELL, Standard**, glass part only, with platinum wires, for those desiring to make their own standard cells. This is the regular H form and may be used to make any of the ordinary forms of standards. 1.50
1027. **CELL, Standard**, glass part only, without platinum wires. .90
1028. **CELL, Standard**, same as No. 1026, on stand as illustrated. 3.50
1031. **CELL, Standard, Eppley**, for students' use. This is an unsaturated cell made up for students' use, without the same degree of care being exercised in its manufacture as is employed in making up cells for precision purposes. It is, however, correct to 1/5 per cent., and may be calibrated against a certified standard cell and a correction factor established. Permanently sealed in glass with depolarizer protected from the light and mounted on wooden support as shown. 8.00
1032. **CELL, Standard, Weston**, unsaturated type, Model 4. Consists of an H-shaped receptacle with platinum leads which pass through the bottom. One limb of the cell contains cadmium amalgam; the other mercury and a paste of mercurous sulphate. The cell is filled to slightly above its cross arm with an unsaturated solution of cadmium sulphate and sealed to prevent evaporation. Porcelain separators prevent the ingredients from becoming mixed. E. M. F. between 1.0184 and 1.0189 volts. With manufacturers' certificate of voltage. 25.00
1033. **CELL, Standard, Weston**. Same as No. 1032, but with Bureau of Standards certificate. 29.50



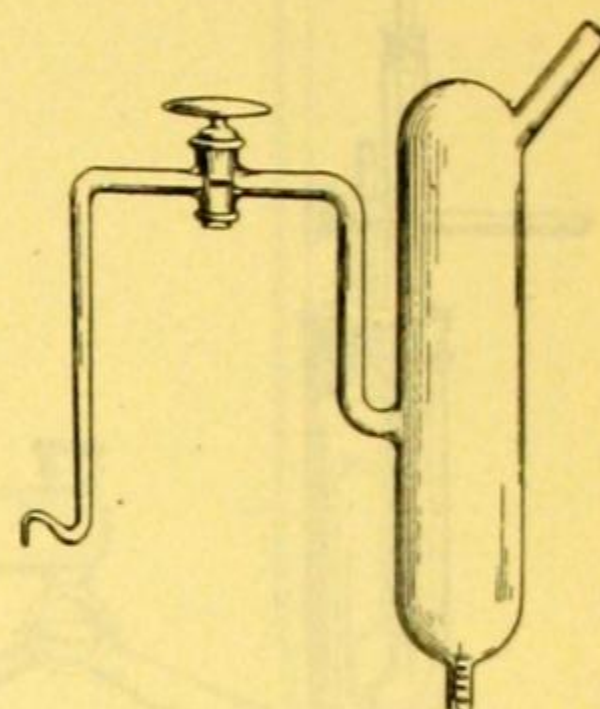
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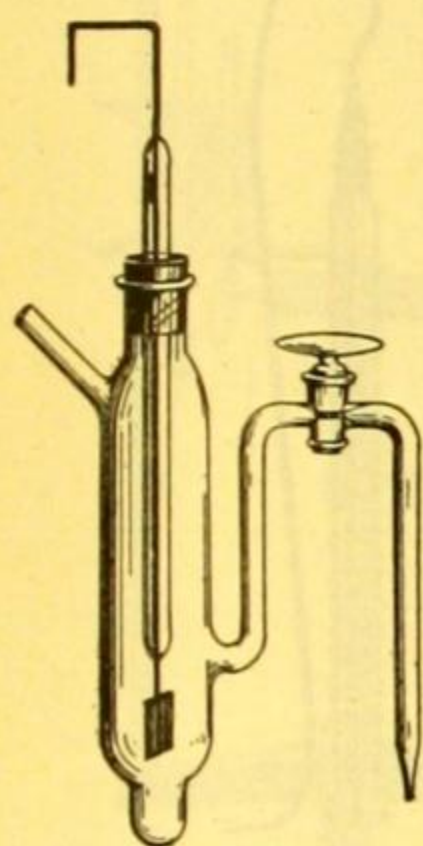
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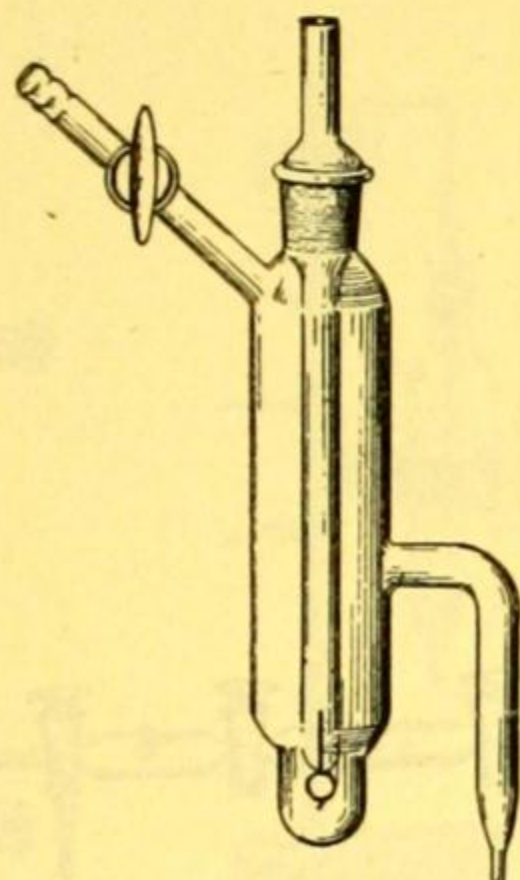
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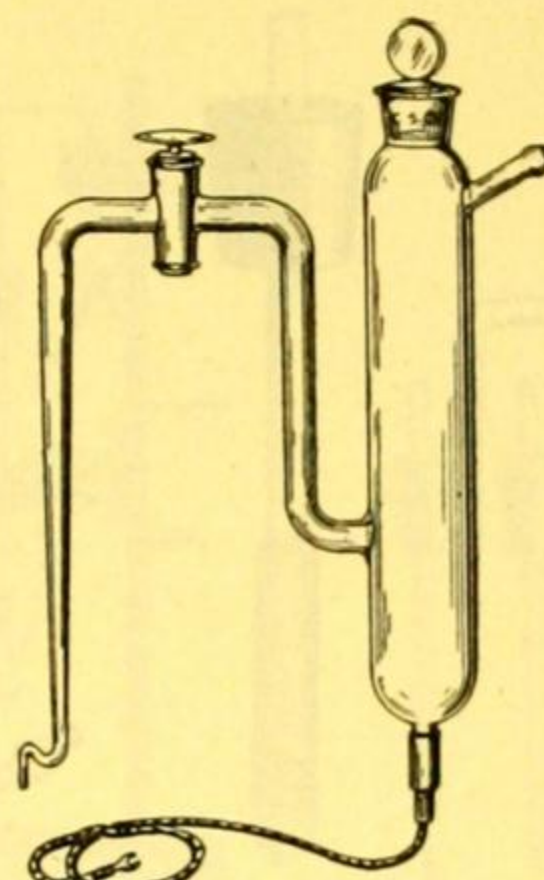
No. 10246.



No. 10248.



No. 10250.



No. 10252.



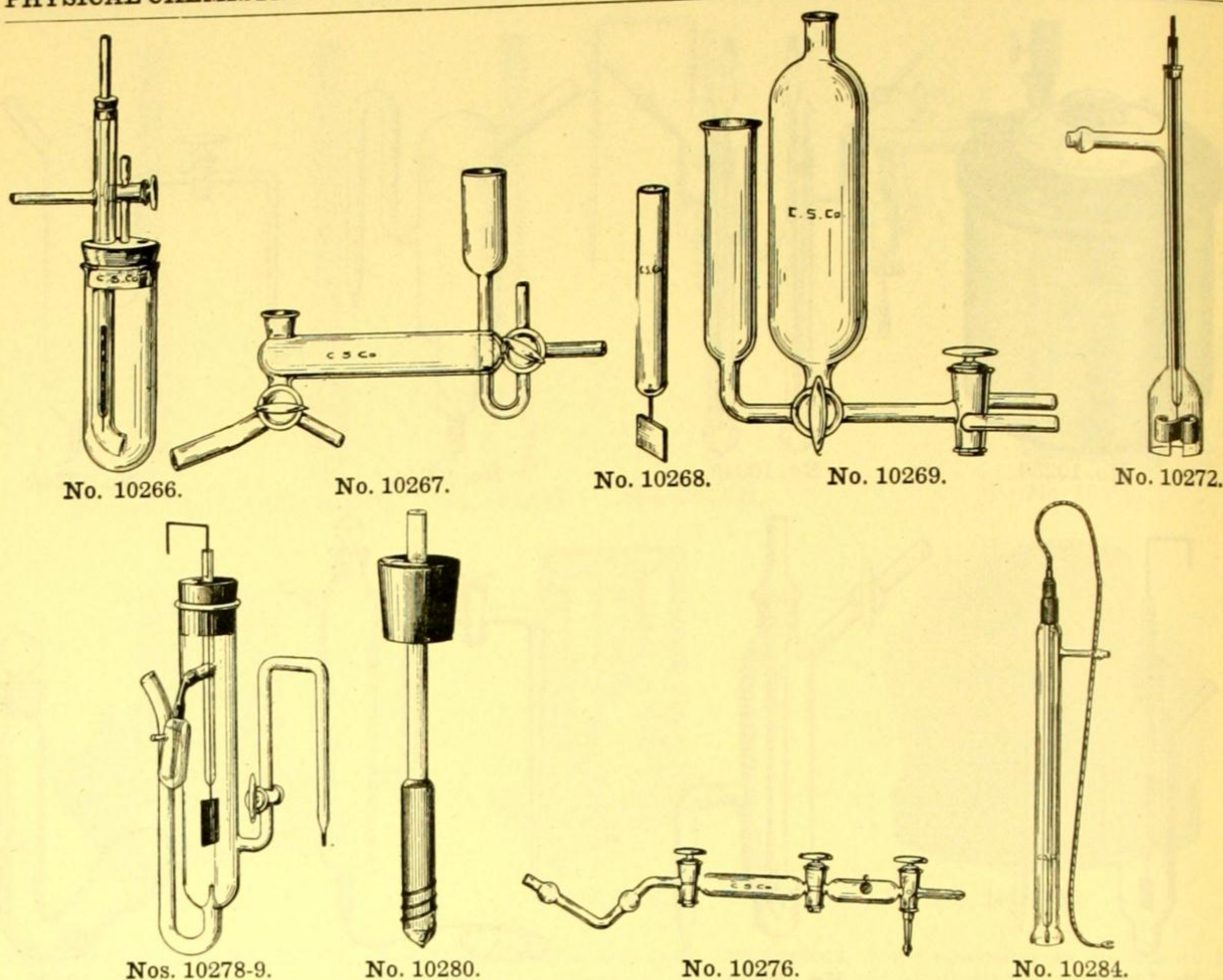
No. 10265.

10239. **CONDENSER, Variable Air, with Vernier Attachment**, for use in balancing the capacity of the cell in conductivity measurements. The condenser is carefully made, well insulated and completely shielded by means of an aluminum case. A scale is provided with 100 divisions, and a knob and lever handle for adjustment of the condenser and vernier plates. Capacity .00007 to .001 microfarad. \$21.80
10240. **COULOMETER, Washburn's Iodine**, as used at the United States Bureau of Standards for determining the value of a Faraday. Complete as illustrated with anode of platinum-iridium, cathode of platinum, bulb tubes, and ground-in siphon tube. Price dependent upon market price of platinum. (See Journal of American Chemical Society, Vol. XXXVI, No. 5, for May, 1914, page 916.)

ELECTRODES, CALOMEL NORMAL AND HYDROGEN

10244. **ELECTRODE, Calomel Normal, Drucker**, with fused-in platinum electrode attached to a coiled piece of copper wire cemented in a glass protecting tube to permit repairing connecting wire when broken. 2.75
10246. **ELECTRODE, Calomel Normal, Hildebrand**, with glass stop-cock on siphon tube and fused-in platinum electrode attached to coiled wire as in No. 10244. (See Journal of American Chemical Society, Vol. XXXV, No. 7, for July 1913, page 851.) 3.00
10248. **ELECTRODE, Calomel Normal, Ostwald**, with removable platinum electrode and glass stop-cock on siphon tube. 5.00
10250. **ELECTRODE, Calomel Normal, Pauli**, for liquids of high resistance, with removable platinum electrode, and short siphon tube. 8.00
10252. **ELECTRODE, Calomel Normal, Wendt**, similar to No. 10246 but with ground glass stopper to facilitate cleaning and with metal ferrule and flexible connecting cord permanently attached. We recommend this as embodying the best features of earlier types. 7.00
10265. **ELECTRODE, Hydrogen, Bailey**, for the determination of Hydrogen Ion concentration of the water extracts of plant material. (See Jour. of Amer. Chem. Soc., Vol. XLII, No. 1, for 1920, page 45.) Complete with gold electrode and platinum wire connections. 3.75
10266. **ELECTRODE, Hydrogen, Bunker**, designed to provide a simple hydrogen electrode for rapid routine measurements of small quantities of test liquids. The essential part of the apparatus is the hydrogen inlet tube, in the lower end of which is an oval shaped opening placed at an angle. The platinum wire constituting the electrode should be located so that the bubble of gas before escaping from this opening completely encloses the wire. When the bubble breaks

(Continued on next page.)

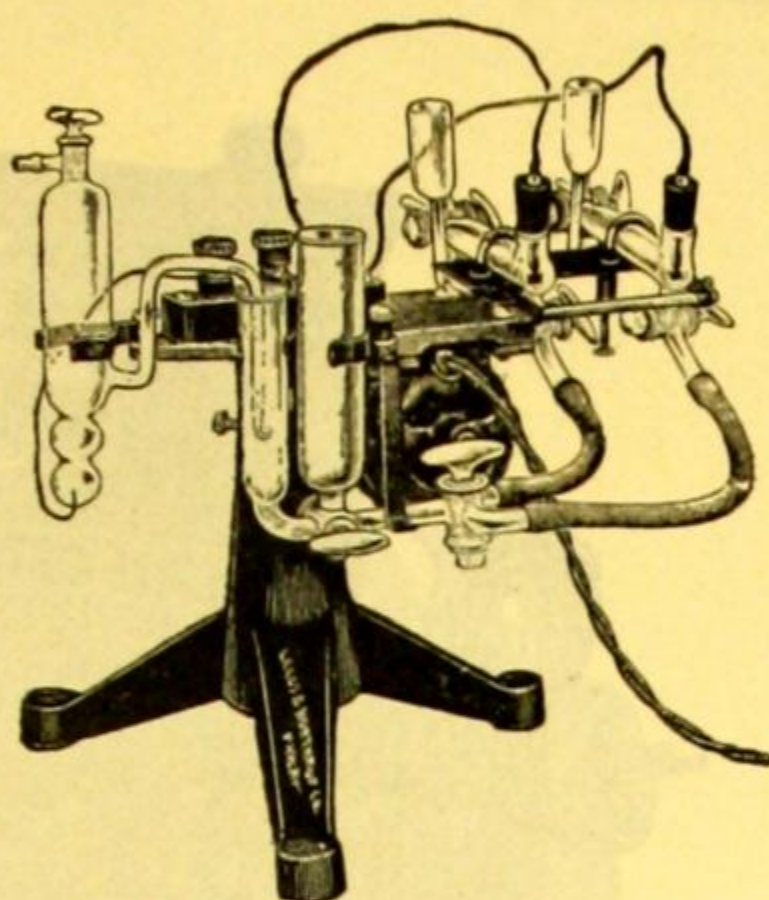


ELECTRODE, Hydrogen, Bunker—Continued.

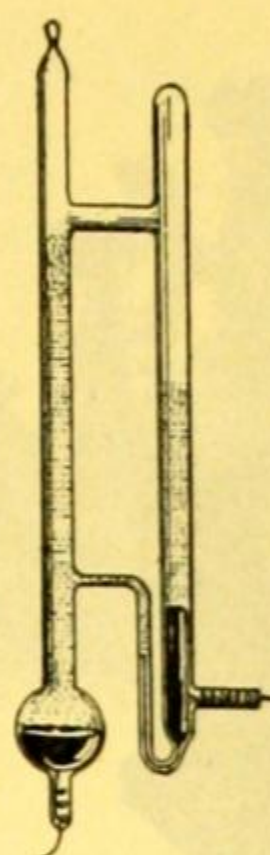
- the liquid rushes into the tube again surrounding the wire. In this manner the same effect is produced as with a rocking electrode. Complete with platinum electrode, hydrogen inlet tube, electrode vessel, stop-cock tube and 3-hole rubber stopper. (See Journal of Biological Chemistry, Vol. XLI, No. 1 for January 1920, page 11.) \$4.85
10267. **ELECTRODE, Hydrogen, Clark**, for use in Hydrogen Ion determinations. With two stop-cocks as illustrated; without platinum electrode. (See Journal of Biological Chemistry, Vol. XXIII, No. 2, for Dec. 1915, page 475.) 10.00
10268. **Platinum Electrode**, for use with No. 10267. Consists of a piece of platinum sheet 6 mm square attached by means of platinum wire to the lower end of a glass tube 40x6 mm. 2.50
10269. **Connecting Vessel, Clark**, for establishing a liquid junction between the calomel electrode and No. 10267 electrode. 7.50
10272. **ELECTRODE, Hydrogen, Hildebrand**, with S-shaped platinum electrode so situated that half its surface is immersed, the other half exposed to the gas. With side tube for introduction of gas. (See Journal of American Chemical Society, Vol. XXXV, No. 7, for July 1913, page 850) 5.50
10276. **ELECTRODE, Hydrogen, McClendon**, especially adapted for use in measuring the H-ion concentration of solutions of which only small quantities are available as in the examination of biological fluids. It has the further advantage of lending itself to shaking by hand. The stop-cocks readily permit the passage of gas from one chamber to the other without causing the fluid to bubble out and also permit the sealing up of the fluid, when saturated with hydrogen, in the electrode chamber. Capacity of electrode chamber, about 2 cc; of overflow chamber, 4½ cc. (See Journal of Biological Chemistry, Vol. XXV, for 1916, pages 669-681.)... 11.00
10278. **ELECTRODE, Hydrogen, Ostwald**, with gas introduction tube, siphon tube with glass stop-cock, and gas exit tube with trap to prevent entrance of air, **but without platinum electrode**. 4.50
10279. **Electrode** for No. 10278, with platinum foil attached to glass tube inserted in rubber stopper. Weight of platinum, about 1.2 grams. 2.50
10280. **Electrode** for No. 10278 with platinum deposited on glass tube inserted in rubber stopper, and with internal contact, according to Luther. 4.00
10284. **ELECTRODE, Hydrogen, Wendt**, as used in Wendt's Electro-Titration Apparatus No. 10312. This electrode is a modification of Hildebrand's (No. 10272), having the advantage that a much shorter time is required for platinization and saturation because of the small surface of bubbles. Slots are cut in opposite sides of the bell to facilitate the escape of gas bubbles. A metal ferrule and flexible connecting cord are permanently attached to the electrode. With side arm for introduction of gas 5.75



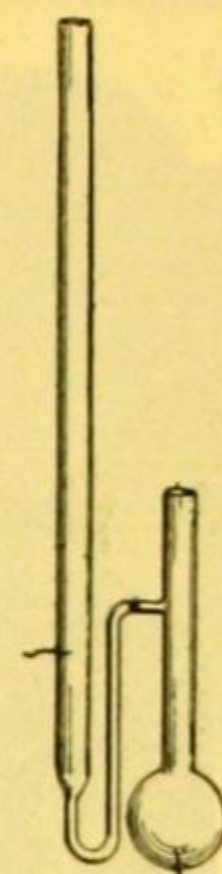
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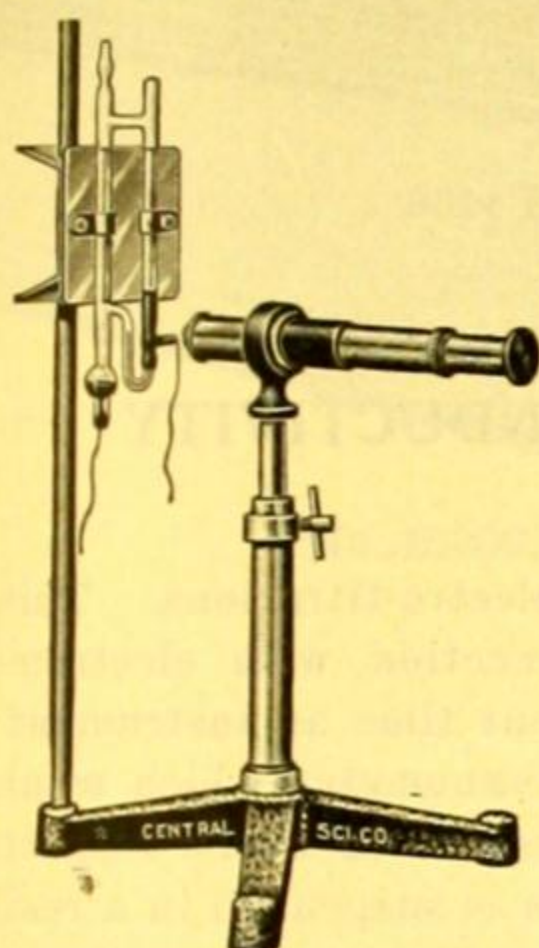
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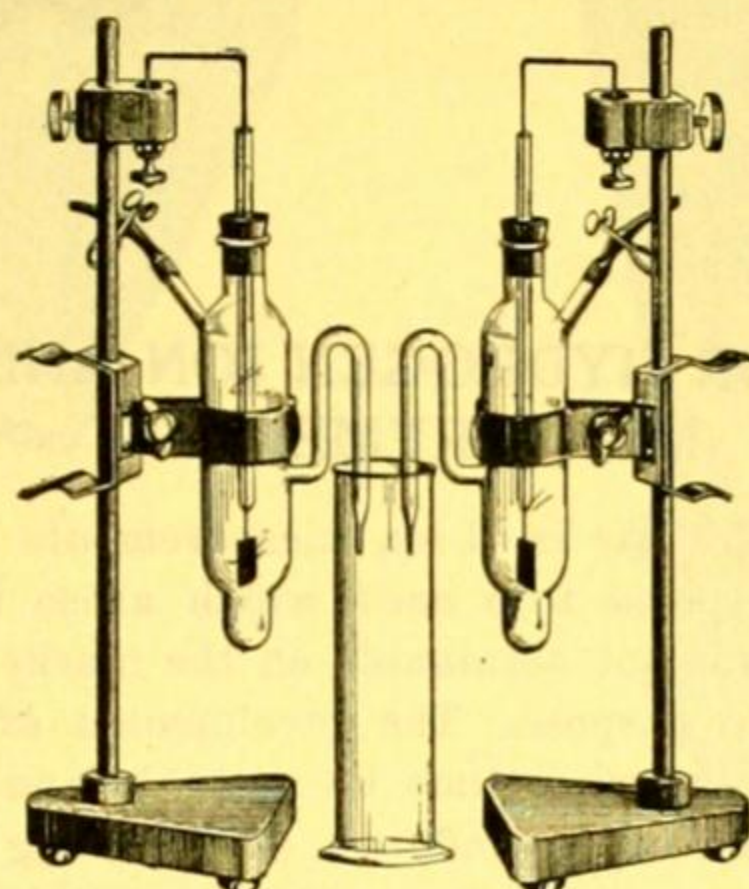
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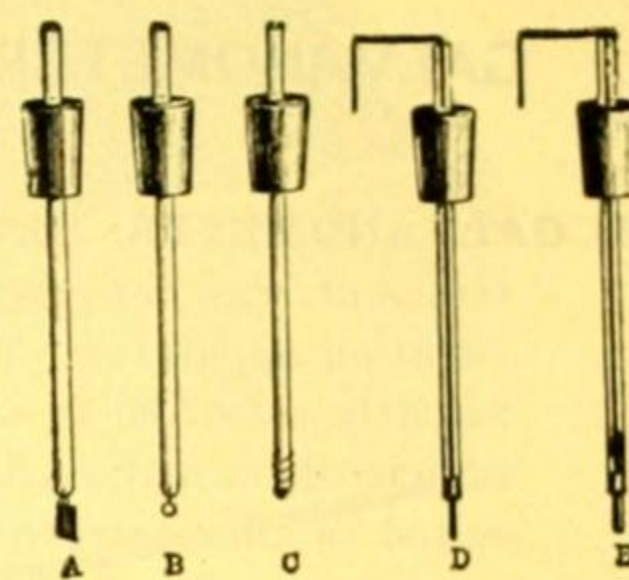
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No. 10300.



No. 10304.

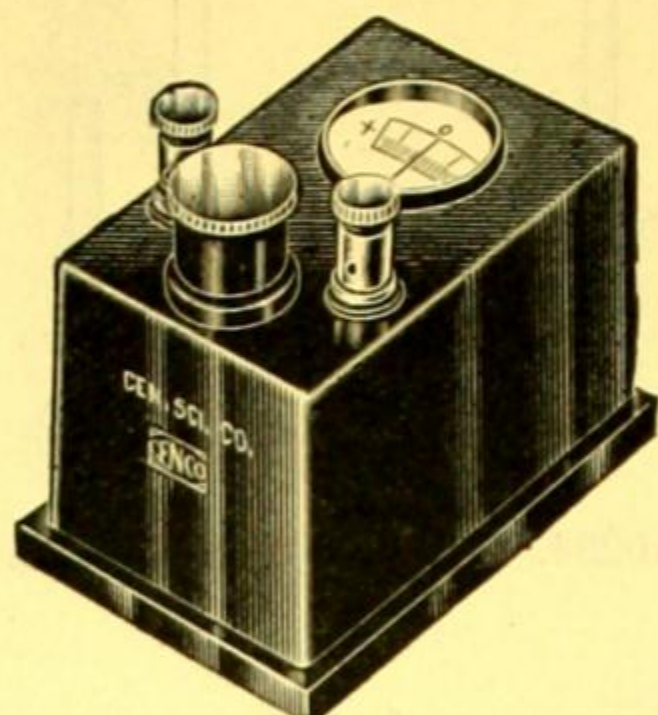


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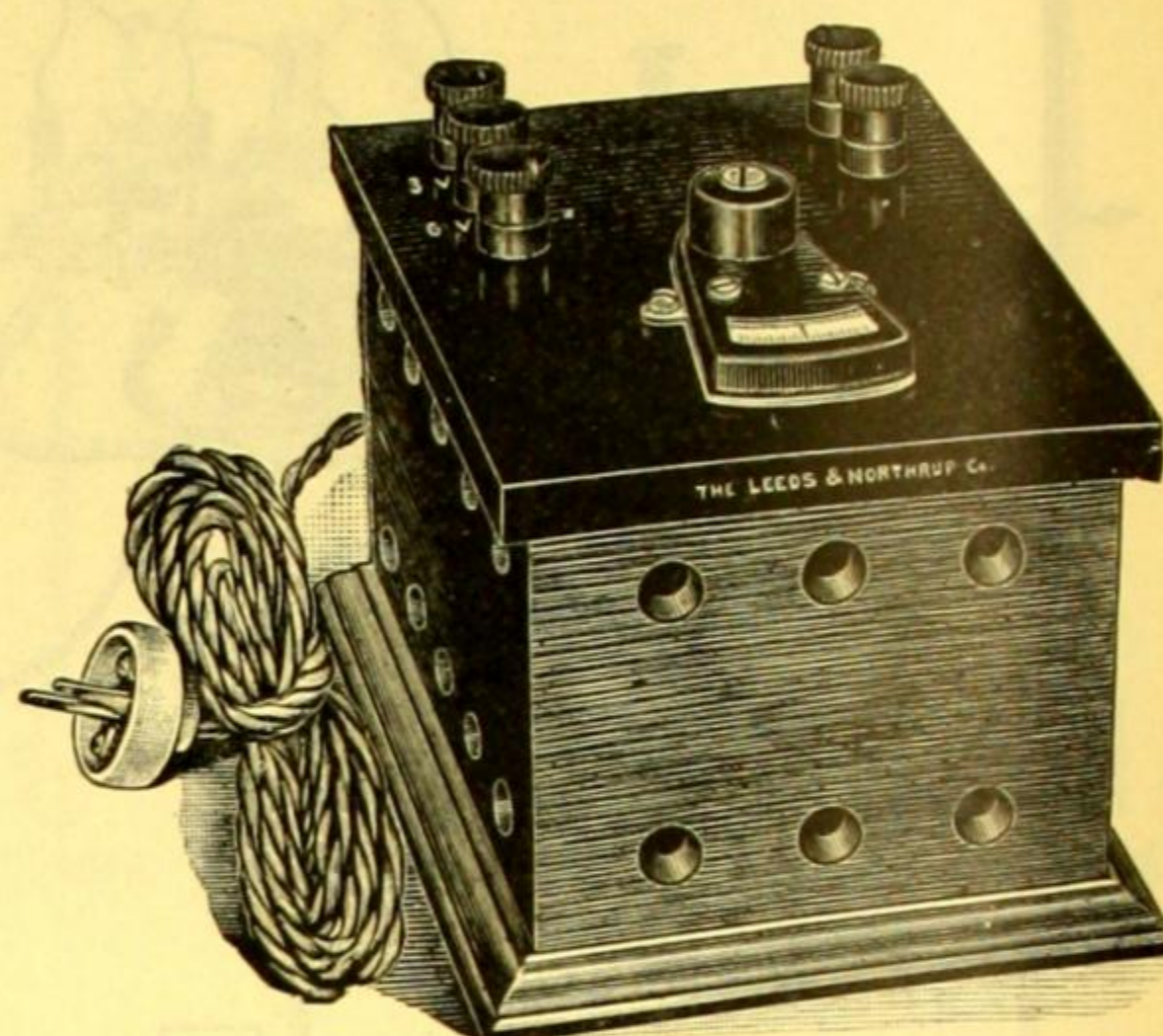
10286. **SUPPORT** for Calomel and Hydrogen Electrodes, consisting of a heavy non-corrosive metal base and rod with clamp to hold glass cells..... \$3.00
10287. **SUPPORT AND SHAKER, Combined, L. & N.**, designed for use with the Clark electrodes for supporting the calomel electrode and connecting vessel and for shaking the hydrogen electrodes. Consists of a heavy tripod base with clamps for holding glassware, binding posts for electrical connections and motor driven shaking device into which the hydrogen electrodes are securely fastened. Illustration shows two No. 10267 Clark Hydrogen Electrodes, one No. 10269 Connecting Vessel and one calomel electrode in place. Complete with electric motor, but without glassware or connections. No.....
- | | | |
|-----------------|----------|----------|
| | A | B |
| For volts | 110 A.C. | 110 D.C. |
| Each | 75.00 | 75.00 |

CAPILLARY ELECTROMETERS

10294. **ELECTRODE TUBE, Capillary, Luther**, filled, exhausted and permanently sealed, with platinum contacts sealed in..... 6.00
10298. **ELECTRODE TUBE, Capillary, Ostwald**, with platinum wire sealed in..... 2.00
10300. **ELECTROMETER, Capillary, Cenco**, for those who prefer the capillary electrode to a sensitive galvanometer for determining the point of balance in electromotive force measurements by the compensation method. The apparatus consists of a No. 10294 Capillary Electrode and a measuring microscope mounted on a suitable support. The microscope is so arranged that it may be readily focused on the mercury meniscus in the capillary. A scale in the eyepiece permits the extent of motion of the meniscus to be measured..... 60.00
10304. **ELECTRODES, Half Elements**, consisting of two glass vessels on supports with heavy non-corrosive bases No. 10286; with adjustable clamps and hard rubber terminals with binding posts. A glass cylinder is provided for connecting the two half elements. Complete with rubber tubing, glass cylinder, pinch clamps and 5 different styles of electrodes as illustrated 15.00
10305. **Electrodes only** of No. 10304, mounted in glass tubes, inserted in rubber stoppers.
- | | | | | | |
|-------------|---------------|---------------|---------------|----------|------------|
| | A | B | C | D | E |
| No. | platinum foil | platinum ring | silver spiral | zinc rod | copper rod |
| Style | 1.00 | .90 | 1.00 | .60 | .50 |
| Each | | | | | 1.10 |
10306. **Glass Cell only** of No. 10304..... .60
10307. **Glass Cylinder only** of No. 10304, for connecting the two elements..... .60
10308. **Mercury Contact Cups only** of No. 10304, of hard rubber with binding post and depression for mercury. With knurled screw for fastening to support rods..... .85



No. F4464.



No. F4466.

GALVANOMETERS FOR HYDROGEN ION AND CONDUCTIVITY MEASUREMENTS

F4464. **GALVANOMETER, Portable**, for use in H-ion measurements and electro-titrations. This instrument was designed in response to a need which arose in connection with electrometric titration apparatus. There was not obtainable on the market at that time an instrument sufficiently sensitive to serve our purpose. The development of a galvanometer which would be sufficiently sensitive, and at the same time be portable and convenient in every respect, resulted in the instrument which is here offered. The moving system is suspended in a resilient mounting with phosphor bronze suspensions, which are light enough to insure good characteristics, but strong enough to sustain even severe jolts. Period $\frac{3}{4}$ second. Resistance 750 ohms. Sensitivity 3 to 4 megohms..... \$25.00

F4466. **GALVANOMETER, Alternating Current**, for use in place of a telephone receiver for determining the point of balance of the bridge in conductivity measurements. This instrument is particularly valuable for measurements in industrial or plant control work in which the line frequency of 60 cycles is employed, and in which the high degree of precision required for research work is not necessary. The three chief advantages of the galvanometer over the telephone receiver are:

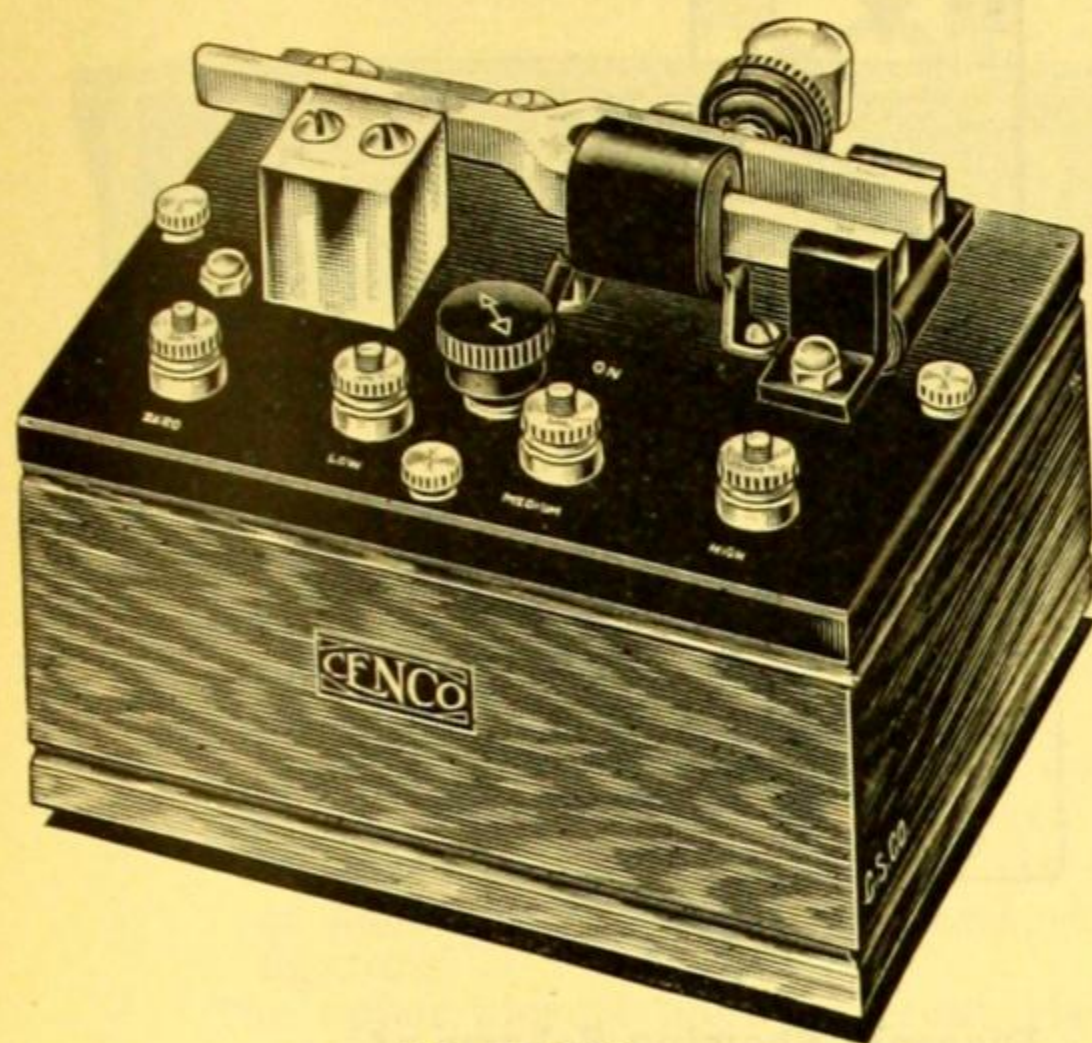
1. It permits the use of 60 cycle current.
2. Noises do not prevent securing a satisfactory balance.
3. The deflection of the pointer indicates in which direction the bridge is unbalanced.

The galvanometer has a laminated field electro-magnet, the winding of which is connected directly across the 110 volt A.C. line. Three binding posts at one side of the top of the case enable three different voltages (3, 6 and 9) to be connected across the bridge circuit. Two posts on the other side constitute the terminals of the moving coil of the galvanometer. Since the current flowing through the moving coil is in synchronism with that in the field magnet, a steady deflection is produced.

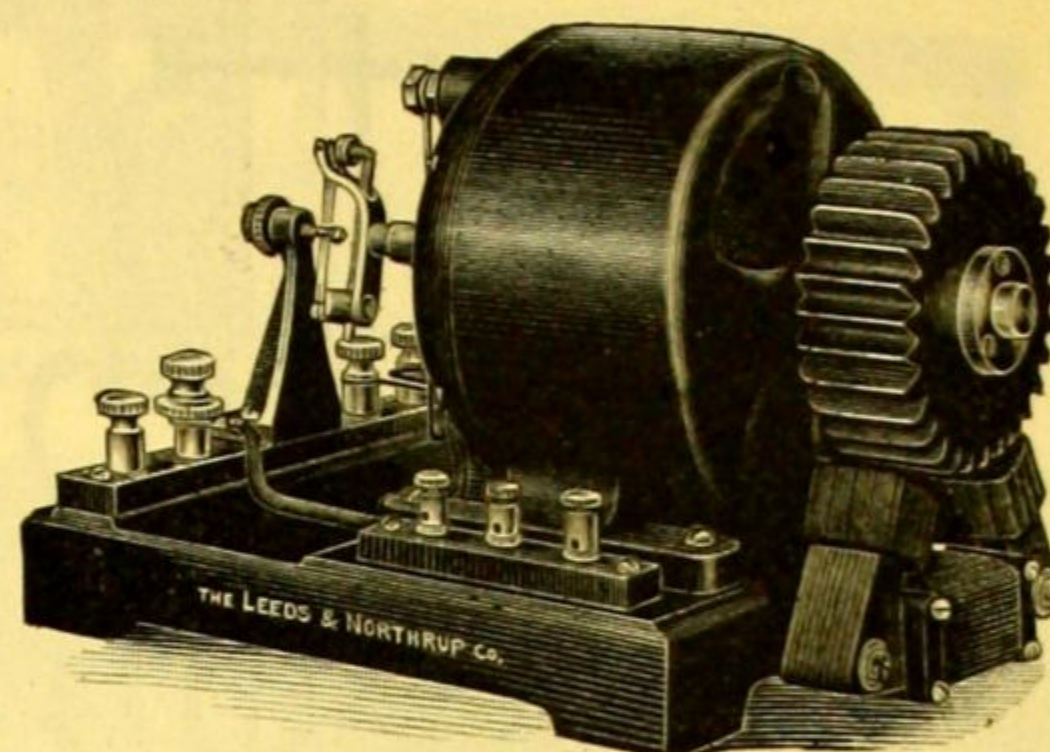
It is advisable to use a one-to-one transformer between the line terminals and the galvanometer in all measurements in which the electrolytic cell or tank and connections are not properly insulated from the earth, in order to avoid damage from high voltage due to the practice of grounding the middle of the transformer in A.C. distribution circuits.

Complete as described with connecting cord and separable attachment plug..... 60.00

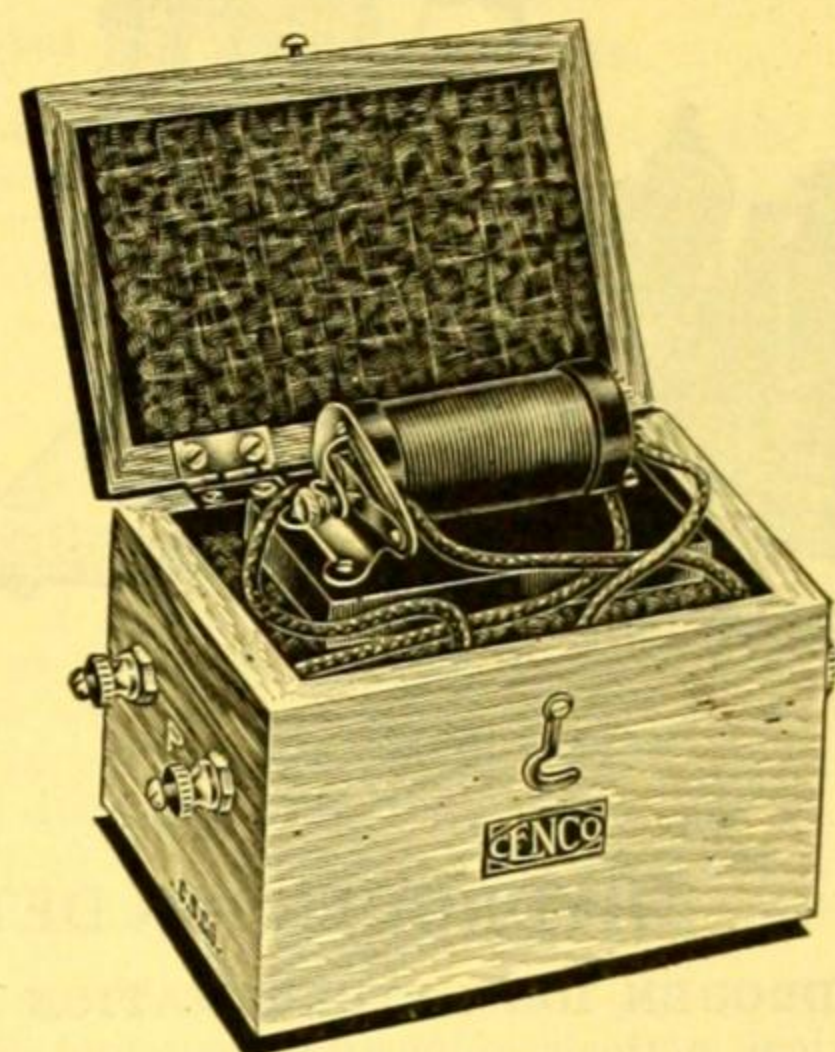
F4467. **Transformer**, 50 watt capacity, with one-to-one ratio, for use with No. F4466..... 15.00
For other **GALVANOMETERS**, see pages 191 to 193 and 204.



No. 10309.



No. 10310.

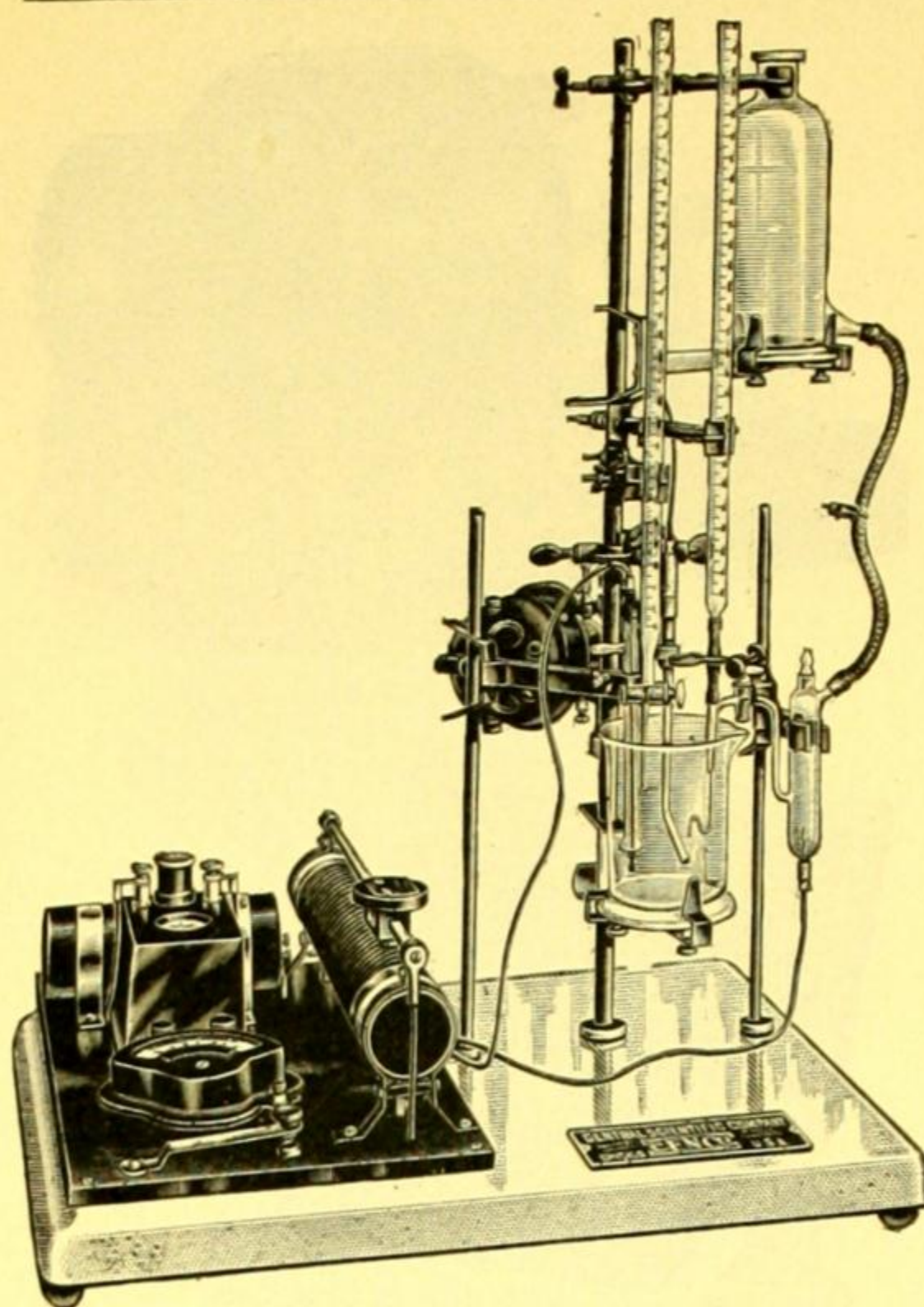


No. F4404.

HIGH FREQUENCY GENERATORS FOR CONDUCTIVITY MEASUREMENTS

10309. **GENERATOR, Audio-Oscillator (Microphone Hummer)**, for producing a practically pure sine-wave current at a constant frequency of 1000 cycles from a 6 volt battery. This device is the best suited for student use in conductivity measurements of any which we have been able to locate. It is automatic in operation and free from trouble. Its energy output is ample for all practical needs in conductivity work and its low price makes it available as individual equipment for each desk. To avoid confusion between the sound of the controlling fork and that in the telephone receiver, the Audio-Oscillator should be placed in a sound-proof box. \$25.00
10310. **GENERATOR, L. & N., Constant Speed, High Frequency**, for producing an approximate sine-wave current at a high frequency for conductivity measurements. The apparatus consists essentially of a constant speed motor with an automatic governor by means of which the speed is held constant within $\frac{1}{4}$ per cent. The governor is adjustable so that the speed can be regulated to the desired frequency. Upon one end of the shaft is mounted a laminated toothed wheel, the teeth of which, in revolving, cut the lines of force of an electro-magnet excited from a 10-volt storage battery, thus producing in the secondary winding upon the magnet an alternating current, the frequency of which equals the product of the number of teeth and the r. p. s. of the motor. The two secondary windings may be connected in parallel or in series by means of external binding posts, producing in the former case a voltage of 12, in the latter, 24. The output is about 2 watts, and is ample for the simultaneous operation of four stations. As described, with universal motor for use on 110 A.C. (60 cycles) or D.C... 200.00
- F4404. **INDUCTION COIL**, simple form after Walker having a frequency of about 1000 vibrations per second. Mounted in a sound proof box 100x100x150 mm outside and lined with felt 10 mm thick 10.00

HYDROGEN ION DETERMINATION APPARATUS. For the determination of Hydrogen Ion Concentration by means of Gas Electrodes Nos. 10265 to 10284, we recommend the use of our No. 10436 Conductivity Bridge together with a Calomel Electrode (No. 10244 to 10252), one of our Resistance Boxes (see Nos. F4703 to F4720), our No. F4464 Portable Galvanometer, and an appropriate source of current (Nos. 1026 to 1033). A Capillary Electrometer (Nos. 10294 to 10300) can be used if desired instead of a Galvanometer. For a complete self-contained outfit, see No. 10312.



No. 10312.

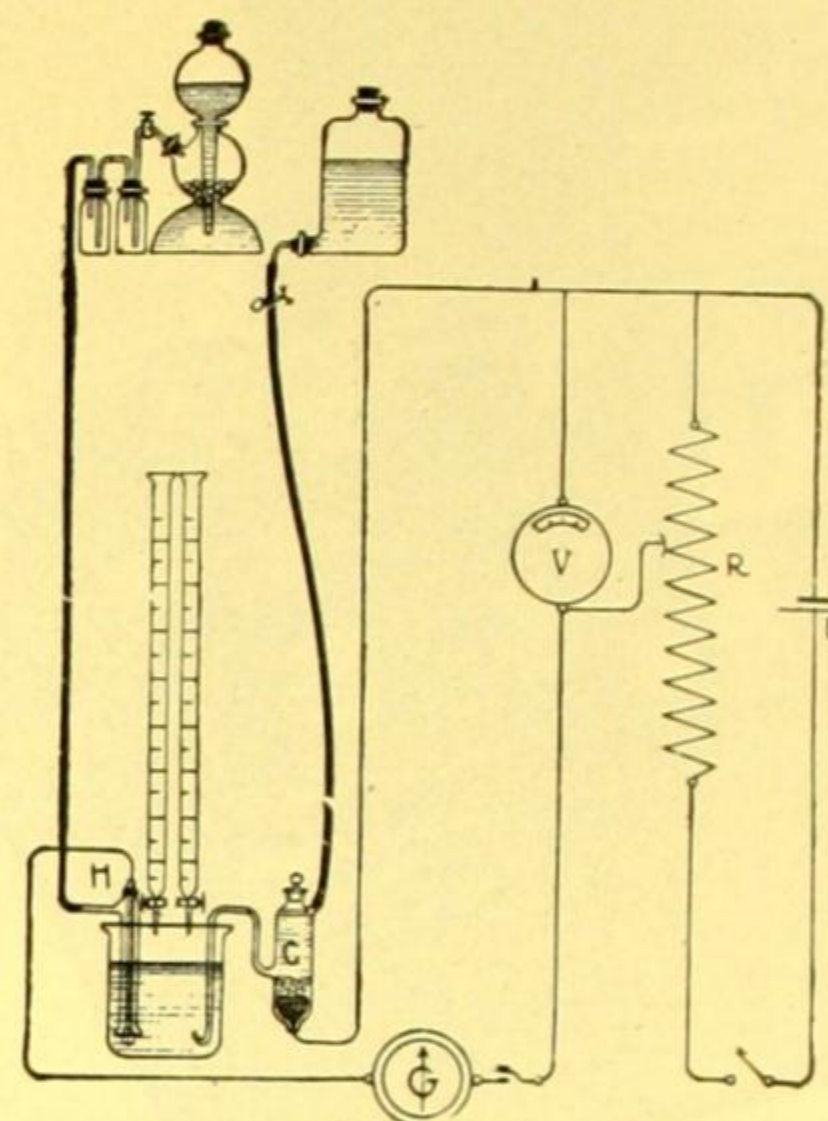


Fig. 1.

Diagram Showing Scheme of Connections.

HYDROGEN ION DETERMINATION APPARATUS

10312. **HYDROGEN ION DETERMINATION APPARATUS, Cenco-Wendt.** The application of electrical methods of measurement and control to chemical reactions has become so important during the past few years that chemistry faculties are making increasing demands that their students be taught the fundamentals upon which these methods are based.

The Cenco-Wendt Electro-Titration Apparatus is excellent not only for practical measurements with the hydrogen electrode, but its design features make it a valuable device for educational work as well. It can be used for the measurement of electrode potentials of all kinds up to a potential difference of 1.2 volts without polarizing the source being measured.

The outfit consists of a tube rheostat used as potential divider with a special Weston voltmeter graduated from 0 to 1200 millivolts, permanently connected across the variable part; a galvanometer (our No. F4464) to indicate when the potential difference of the calomel-hydrogen cell is balanced by the variable fall of potential; a dry cell and tapping key—all neatly mounted on a **black bakelite** plate. This insures permanency of insulation in the wiring. The instrument panel is, in turn, mounted on a **white porcelain enameled** iron base, which extends to the right sufficiently far to provide room for the chemical support rods which hold the electrodes, burettes, beakers, etc., that are used in the experiment. The rods are firmly secured in the iron base. The central rod will also hold a stirring motor like our No. 12860, where this is required. We strongly recommend this apparatus to departments of physical chemistry offering courses in laboratory technique and methods to students of chemistry, biology, physiology, and the medical sciences. (For complete description, see pages 216-217 or send for Bulletin 86.) Price, as illustrated, but not including stirring motor, burettes or beaker

10252. **Electrode, Calomel**, only of No. 10312. \$150.00

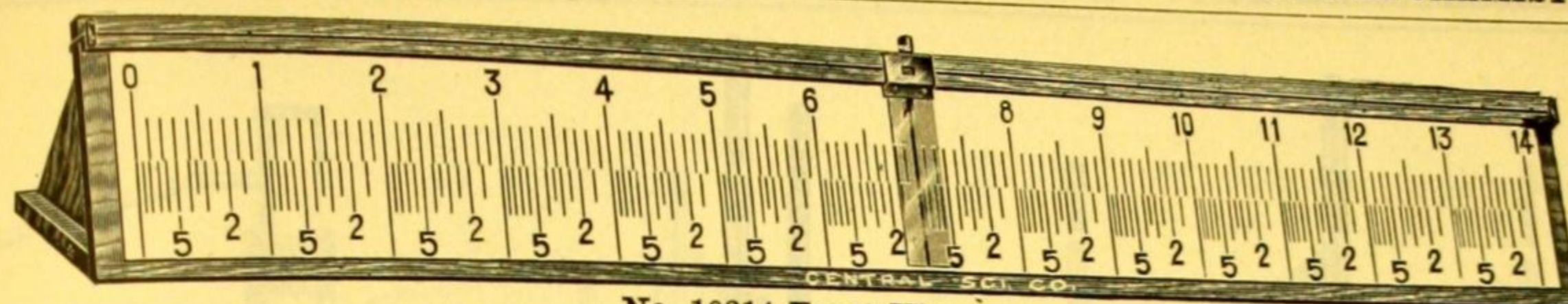
10284. **Electrode, Hydrogen**, of No. 10312. 7.00

For Burettes for use with No. 10312, see pages 99-100. 5.75

12860. **MOTOR STIRRER, Cenco Universal Friction-Drive**, for use with No. 10312 for maintaining continuous agitation during titration. Complete with connecting cord and attachment plug, but without stirring rod.

No.	A	B	C	D
	A.C.		D.C.	
For volts	110	220	110	220
Each	35.00	37.00	35.00	37.00

12861. **Flexible Shaft and Guide**, for use with No. 12860, enabling the Stirrer to be turned to one side, where it will not interfere with the working parts of the apparatus. The guide is attached to the central support rod by means of the right angle clamp furnished with No. 10312. 4.00



No. 10314 Front View.



No. 10314 Rear View Showing Standard and Dry Cells in Place.

10314. HYDROGEN ION DETERMINATION APPARATUS, Cenco Demonstration Form. The present great interest in hydrogen electrode measurements has given rise to a requirement for a simple apparatus by means of which the measurement of hydrogen ion concentration can easily be demonstrated to an audience. To meet this need we have designed this apparatus, now offered for the first time, which consists of a potentiometer circuit so arranged that the Sørensen number (pH) or the hydrogen ion concentration is directly indicated when the potentiometer is balanced. Although the apparatus is intended only for demonstration, it is capable of accuracy to 0.1 pH unit and of a precision (repetition of setting) more close than this figure.

The upper picture shows a front view of the instrument, the side which is seen by the audience. The scale length is 140 cm so that the length of one whole pH division is 10 cm. Along the upper edge of the scale is the slide-wire on which contact is made by a movable contact spring. The latter carries a transparent rider with an index line. Values of the hydrogen ion concentration are read on the lower, and pH numbers on the upper scale. The former is of the multiple logarithmic type, graduated similarly to a slide rule. Any reading under the index represents the multiplying factor of 10 with a negative exponent, the entire number representing normality of hydrogen-ions. The negative exponent of 10 has a numerical value indicated by the nearest pH number to the right of the index.

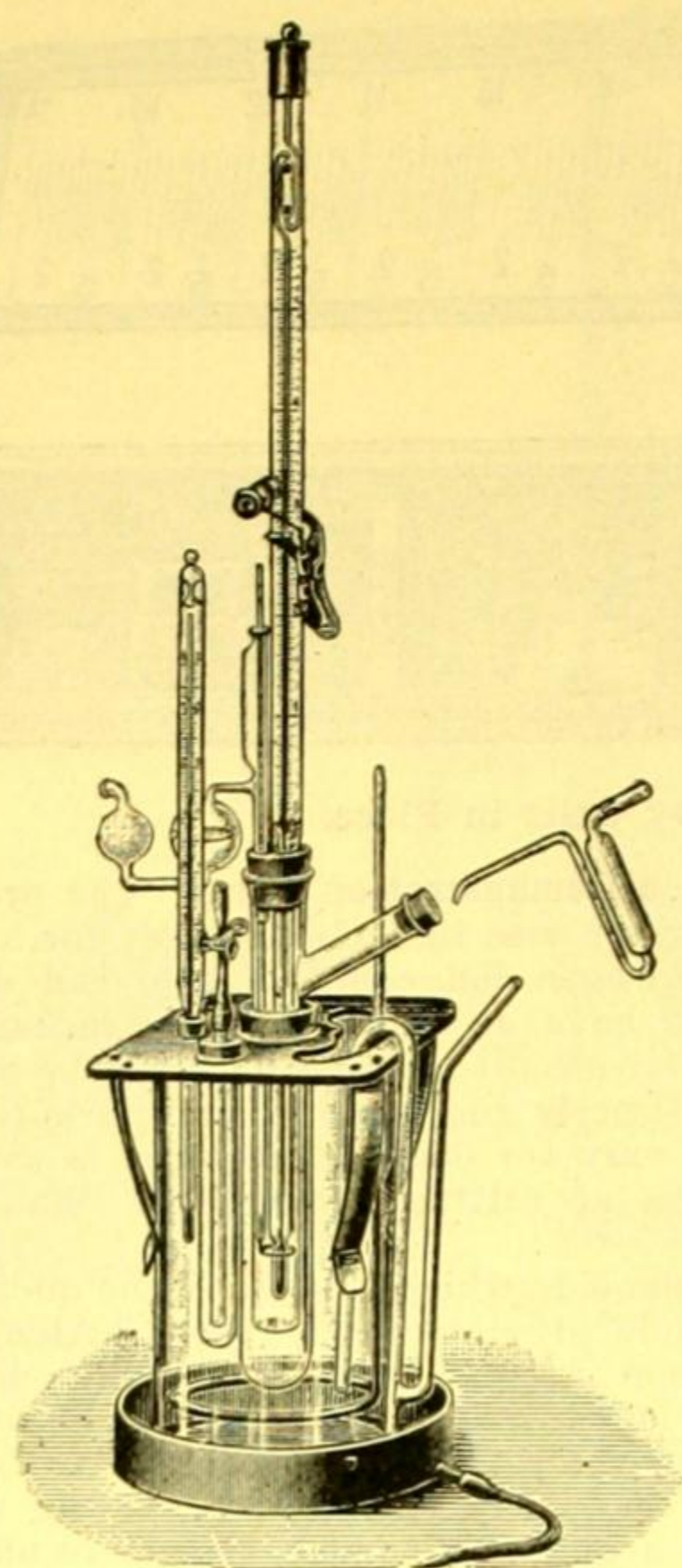
In the rear view of the instrument are seen first the rheostat for the coarse adjustment of the working current, and a single slide-wire, on the left, for fine adjustment of this current. In the second compartment should be two dry cells connected in series for furnishing the working current. These are to be connected to the posts marked "BATT." In the middle section are two tapping keys for connecting the galvanometer in circuit when desired. The left hand key also puts into the circuit a high resistance which protects both galvanometer and gas chain against excessive current when the potentiometer is far from balance. The galvanometer is connected to the binding posts marked "GALV." The pair of binding posts to the right of the keys serves for connection of the calomel cell and hydrogen electrode respectively, and the remaining pair for connection of the standard cell. The double throw switch enables the demonstrator to connect either the standard cell or the gas chain into the circuit. Finally a sliding contact, shown on the right of the illustration, enables one to take care of the possible variations in calomel electrode potential.

The operation of the apparatus consists, first, of adjusting the working current with reference to the standard cell until the potentiometer shows a balance. When this has been done the switch is thrown over and, with the hydrogen electrode immersed in a solution of known pH, another balance is obtained, the index slide having been set to the known pH value. In the latter case the balance is obtained by moving the compensating slide before mentioned. This automatically establishes the proper relation between the scale and the slide wire. The potentiometer is now ready for readings on solutions of unknown hydrogen ion concentration and for titrations.

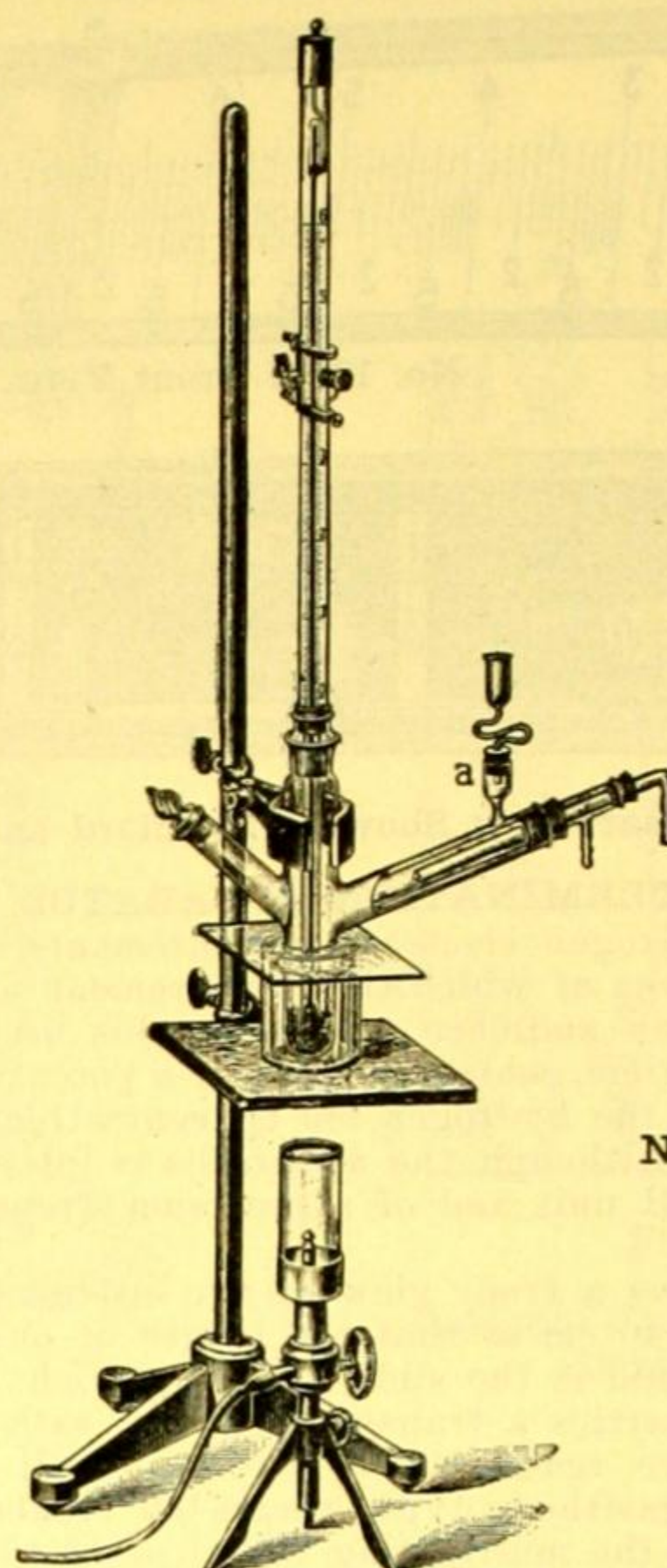
It has been recognized that there is no method superior to that of the hydrogen electrode for giving students an insight into the meaning of "acidity", and such designations as "actual" and "total" reactions. We believe that this apparatus will go far toward simplifying the manipulations and toward demonstrating in the clearest possible manner the significance of all processes in which hydrogen ion concentration is involved. This apparatus also serves splendidly to demonstrate the principle of the potentiometer method of measurement of potential, and for this reason is of value to laboratories of physics as well as of physical chemistry.

In addition to the Demonstration Hydrogen Ion Determination Apparatus, there is required for a complete demonstration equipment a Standard Cell, such as our No. 1032; two Dry Cells No. 964; a sensitive Lecture Table Galvanometer, for which No. F4460 (page 204) will serve very nicely; and a Gas Chain made up of any standard type of hydrogen and calomel electrodes (see Nos. 10244-10284). This apparatus may be used in connection with the Wendt Apparatus by connecting the two electrodes of the latter to the Demonstration Apparatus. These two pieces together illustrate very nicely the two common methods of measuring H-Ion concentration: the potentiometer method, using a known, constant potential, and the Hildebrand method, using an indefinite potential and a calibrated voltmeter.

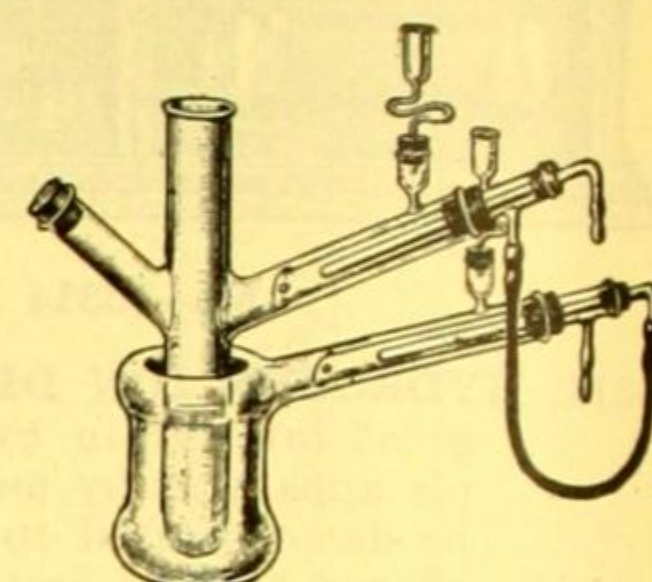
Complete as described, with rheostat but without dry cells, standard cell or galvanometer \$90.00



No. 10340.



No. 10364.

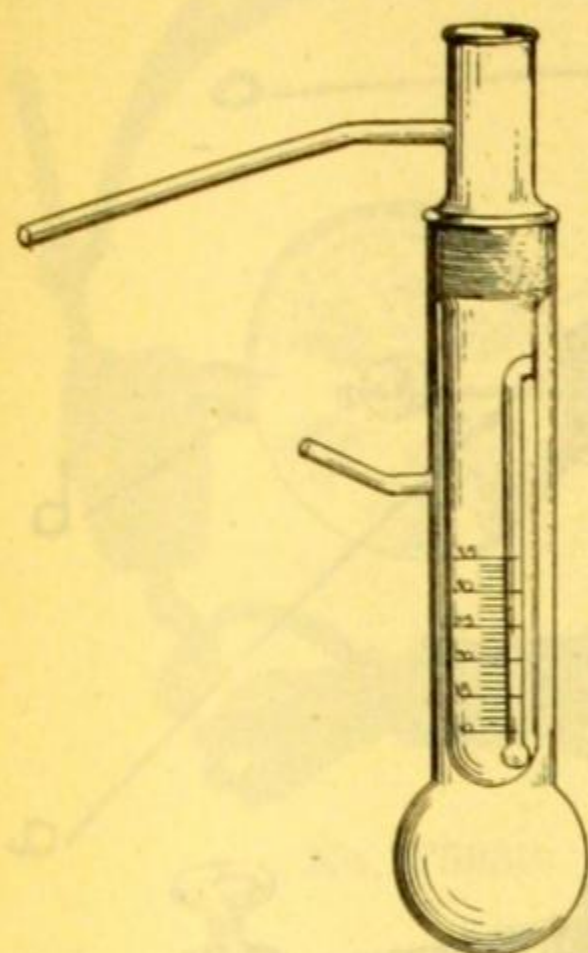


No. 10367 Shown in Use.

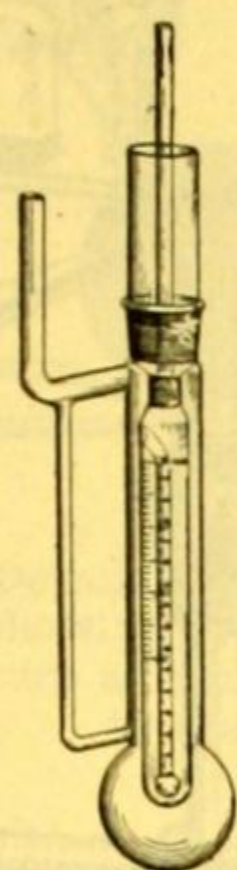
10340. **MOLECULAR WEIGHT DETERMINATION APPARATUS, Beckmann's, by the Freezing Point Method.** Consists of a glass cooling jar with nicked cover and stirrer, 4 air jackets, 4 freezing tubes with corks, 3 filling pipettes, 1 inoculating rod, 1 rubber stopper, zinc trough with glass siphon for drawing off the cooling solution, and sulphuric acid drying tube for use with hygroscopic solutions, but without thermometers \$22.00

Parts and Accessories for No. 10340.

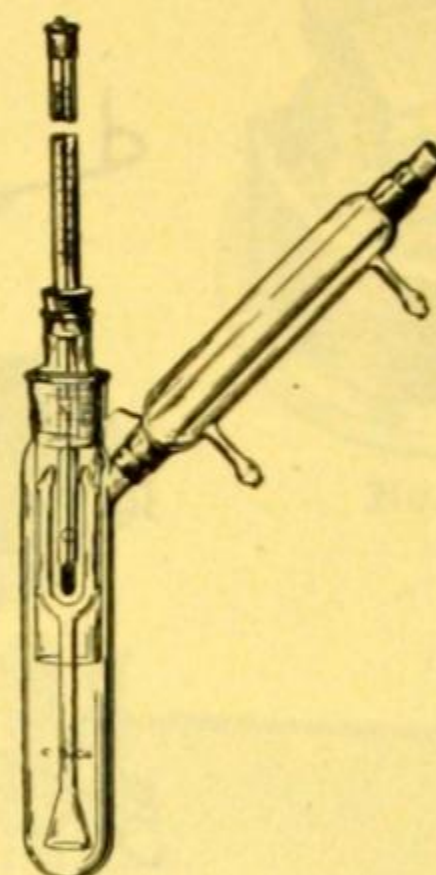
- | | |
|---|-------|
| 10341. Air Jacket | .75 |
| 10342. Cooling Vessel with nicked cover and stirrer | 4.50 |
| 10343. Filling Pipette | 1.00 |
| 10344. Freezing Tube, with corks..... | 1.00 |
| 10345. Freezing Tube, with ground in stopper and ground in tubulation for thermometer..... | 2.50 |
| 10346. Inoculating Rod | .40 |
| 10347. Stirrer of glass with platinum ring containing about 2.1 grams platinum. Price dependent on market price of platinum. | |
| 10348. Sulphuric Acid Drying Tube..... | 1.30 |
| 13454. Thermometer for cooling mixture, graduated from -50° to 50° C., in $1/5$ degree divisions | 5.00 |
| 13518. Thermometer, Beckmann Differential, with auxiliary scale, graduated in $1/100^{\circ}$ divisions | 15.00 |
| 10350. Zinc Trough, with siphon..... | 2.25 |
| 10351. Siphon only of No. 10350..... | 1.00 |
| 10364. MOLECULAR WEIGHT DETERMINATION APPARATUS, Beckmann, by the Boiling Point Method. Consists of an iron support with clamp and ring; boiling cylinder with drying tube, ground stopper and tubulature, and with inner condenser; one pair glass jackets with mica cover plate and asbestos pad; rubber stoppers; but without burner or thermometers... | 12.50 |
| 10365. Boiling Point Tube for No. 10364, with ground in stopper and tubulature..... | 5.50 |
| 2020. Argand Burner for No. 10364, with mica chimney | 1.60 |
| 10367. Steam Jacket for No. 10364, for use with liquids of high boiling points, with inner condenser. | 6.50 |
| Thermometer, Beckmann Differential, for No. 10364, see No. 13518 above. | |



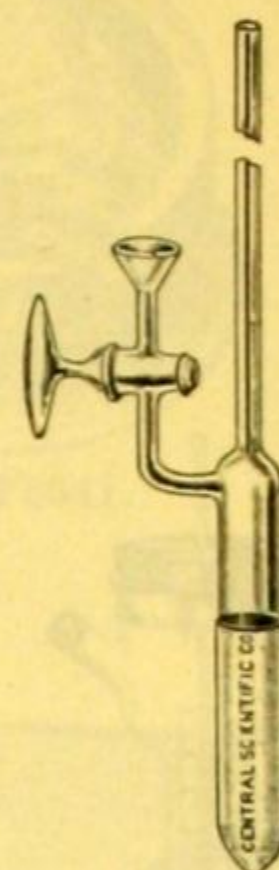
No. 10376.



No. 10380.



No. 10384.



No. F937.

10376. **MOLECULAR WEIGHT DETERMINATION APPARATUS**, McCoy, consisting of a graduated inner vessel and jacket with rubber connection between. (See Journal of American Chemical Society, Vol. XXII, for April 1900)..... \$4.50

10380. **MOLECULAR WEIGHT DETERMINATION APPARATUS**, Menzies, for determining molecular weights by measurements of the vapor pressure. The apparatus consists of a graduated inner vessel and outer jacket ground together. It can be used for two purposes: (1) the determination of the molecular weights of dissolved substances by measuring the lowering of vapor pressure of the solution; (2) the determination of molecular weights of easily volatile substances by measuring their vapor pressures. It requires no thermometer or accessory apparatus, and can be supported on any ring stand. A complete determination requires only from 30 to 40 minutes including the time of weighing. Complete as described..... 8.00

10384. **MOLECULAR WEIGHT DETERMINATION (BOILING POINT) APPARATUS**, Washburn-Cottrell, designed to overcome the difficulties of measurement with other designs, due chiefly to imperfect equilibrium between the liquid and vapor phases. The special feature is the "percolator" arrangement by which fresh liquid is continuously pumped to the top and discharged against the Beckmann thermometer. Its advantages may be summarized as follows:

1. Provides perfect equilibrium between liquid and vapor phases.
2. Enables the exact determination of the temperature of equilibrium to be made when both phases are under same external pressure.
3. Prevents superheating.
4. Reduces to a minimum variations due to size of flame, drafts of air, height of liquid, etc.
5. Insures a constancy of the mercury column ten times as great as in other methods.
6. Permits the accurate determination of molecular weights by the ebullioscopic method.

Without Beckmann thermometer..... 30.00

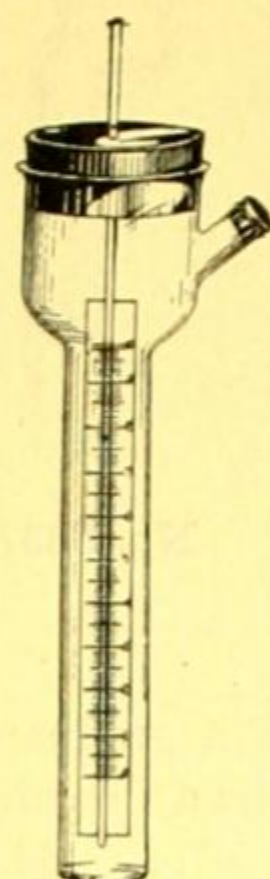
F937. **OSMOTIC PRESSURE TUBE**, University of Chicago form, consisting of a glass tube of small bore 5 feet long, with side arm with stop-cock and funnel tube. Complete with membrane for attachment to lower end..... 4.25

F937A. **Animal Membranes** for use with No. F937.....each .40

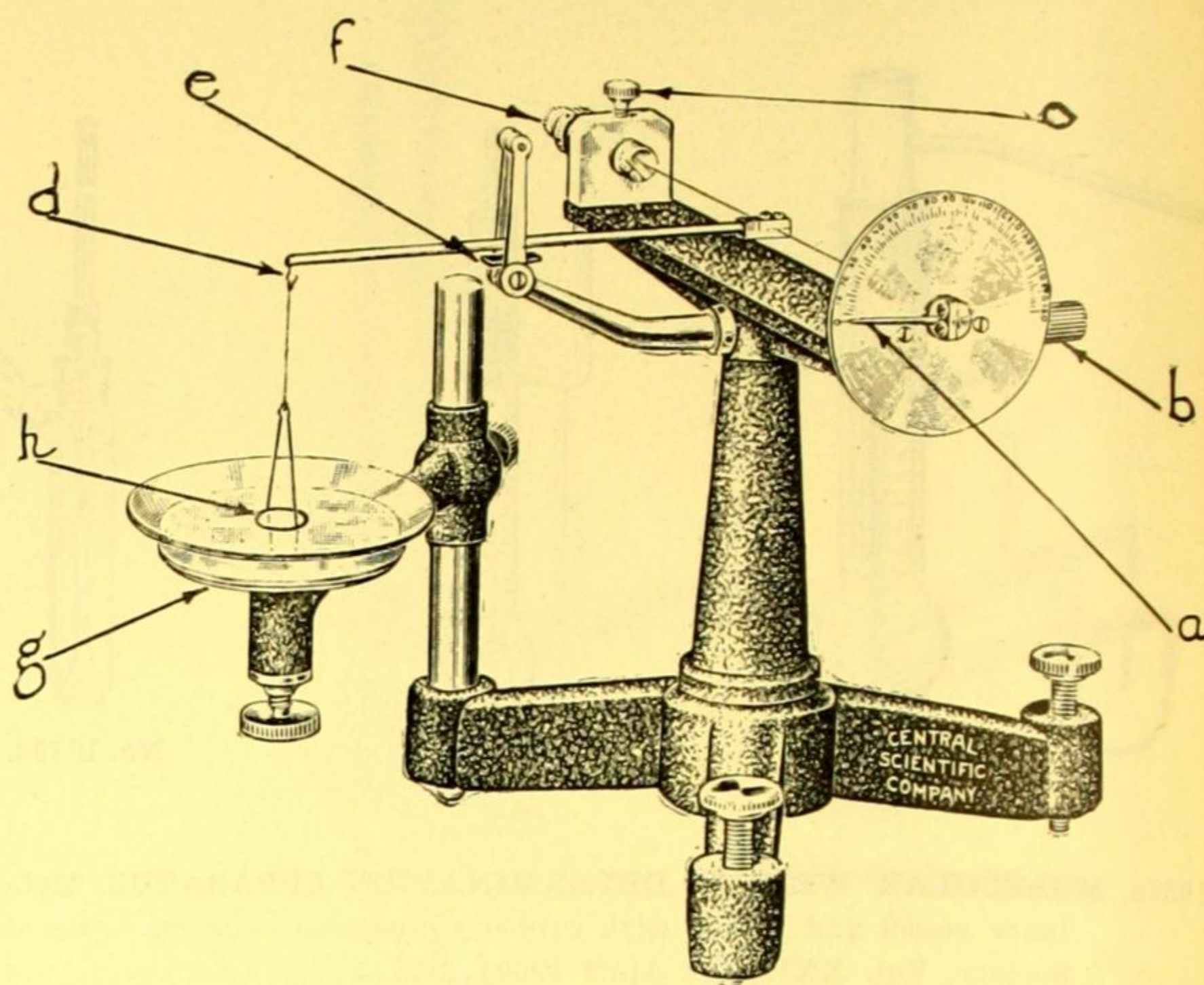
POLARIZING APPARATUS, see **Polariscopes**.

PYCNUMETERS, see **Bottles**, Specific Gravity.

RESISTANCES AND RHEOSTATS, see general heading **Electrical Instruments**.



No. 10396.



No. 10400.

SURFACE TENSION APPARATUS

10396. **SURFACE TENSION APPARATUS**, simple form, with straight capillary tube of fine bore, glass scale graduated in mm and immersion tube with side arm and rubber stopper. (See Findlay's Practical Physical Chemistry, page 91.) \$4.00

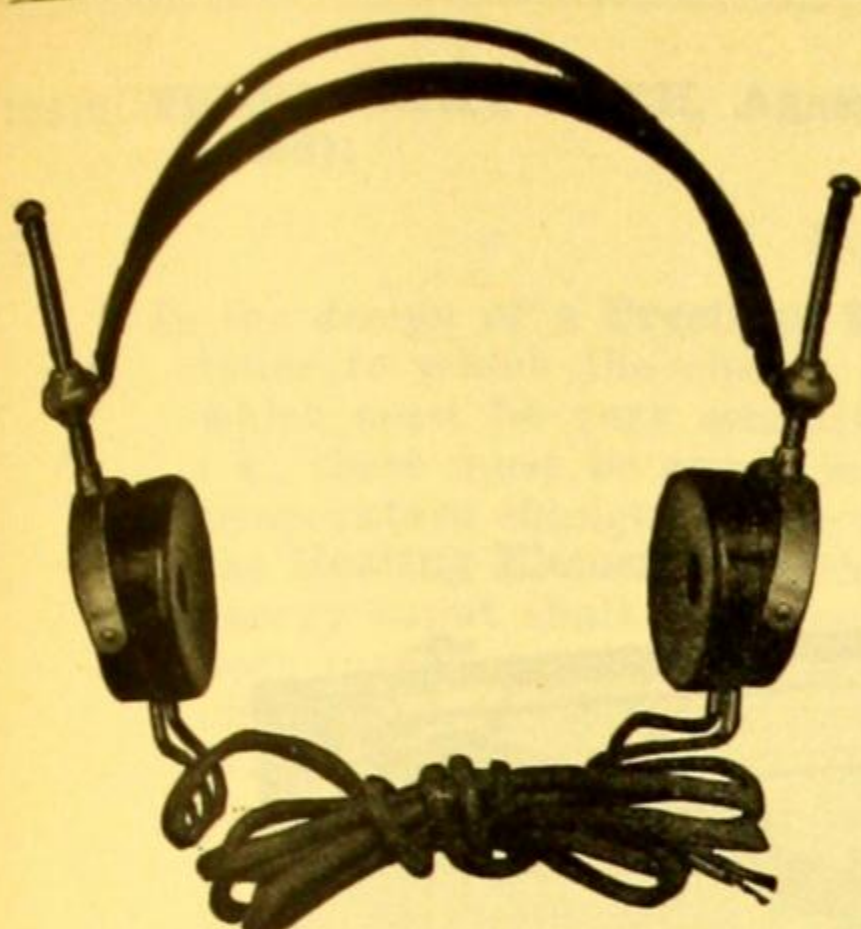
10400. **SURFACE TENSION APPARATUS**, du Noüy, designed by Dr. P. L. du Noüy with the Carrel Mission at the Rockefeller Institute, for rapidly and accurately measuring the surface tension of liquids of all kinds. The instrument consists essentially of a stand provided at the top with a fine steel wire stretched between end supports. One end of the wire is tightly clamped, the other being attached to a worm wheel controlled by thumb-screw (b). To the worm wheel is also attached a pointer (a) which moves over a metal scale graduated in degrees. To the middle of the wire is clamped a hollow, light steel lever (d) with a small hook in the outer end. A stirrup is attached to this hook carrying a carefully made loop (h) of platinum-iridium wire with a periphery exactly 4 cm in length.

The watch glass, or other vessel containing the liquid whose surface tension is to be determined, is placed on the platform (g) and carefully raised by means of the adjusting screw until the platinum loop has made contact with the liquid. The pointer (a) having been previously set at zero, the torsion of the wire is gradually increased by means of the thumb-screw (b) controlling the worm gear, until the loop of wire tears loose from the liquid. The number of degrees is then read from the scale and by a simple calculation is converted directly into dynes per cm.

This instrument provides the most rapid and direct-reading device for measuring surface tension which has yet been produced. The method is simple, yet capable of a high degree of precision in measurement. This is the only device by which the surface tension of colloidal liquids can be accurately determined. A feature of special importance is the fact that a complete determination can be made in from 15 to 30 seconds, and results can be duplicated over and over with perfect agreement. Furthermore, in this method, errors from evaporation are negligible. Another interesting feature of the instrument is the small amount of liquid required, 1 cc being sufficient. This permits it a wide use particularly with biological fluids, which are usually available in small quantities. The instrument can be readily and quickly standardized by the use of pure water at 20° C.

The instrument is beautifully made, with all parts carefully machined and fitted by hand, and is elegantly finished in our crystal black instrument finish. Only the best materials and the highest degree of skilled workmanship are employed in its construction. At the same time, it is rugged and free from delicate bearings and parts which are subject to wear. Leveling screws are provided in order to keep the platform horizontal. For Dr. du Noüy's description of the method of use, see Journal of General Physiology, Vol. I, No. 5, for May 20, 1919, pages 521-524, or send for Bulletin 82. Complete as illustrated with loop of platinum-iridium wire, in polished hardwood case, with directions for use. Without watch glass. 60.00

10400A. **Platinum Loops**, extra for No. 10400.....each 4.50



No. F3939.



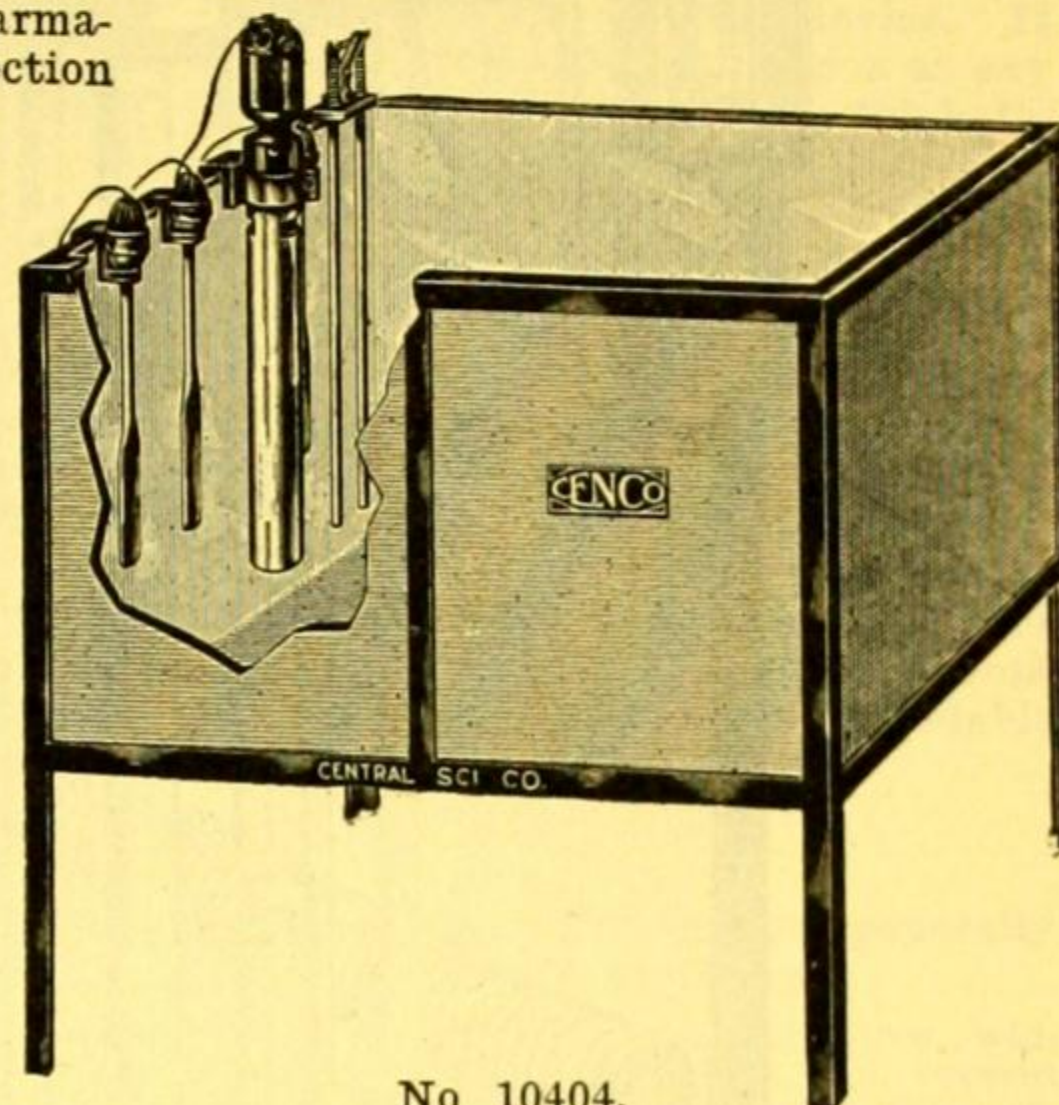
Detail of No. F3941 showing end of armature and link connection to diaphragm.



No. F3941.



No. F3942.



No. 10404.

TELEPHONE RECEIVERS

- F3939. TELEPHONE RECEIVERS, Pair, 2000 ohms, durable and permanently adjusted for maximum sensitiveness.** The head bands are spring phosphor bronze, covered with black webbing. The receivers are supported from the side rather than from the back, a feature which permits adjustment to all possible angles without the use of a single adjusting screw. A connecting cord five feet long is supplied with each set \$5.00
- F3941. TELEPHONE RECEIVERS, Baldwin, Mica Diaphragm, designed on a new principle which makes them more sensitive than the older type.** The diaphragm is of thin mica and is connected to the armature, a separate piece, by a small link, thus eliminating strains which are present in the usual metal diaphragm. The armature is of the polarized type, responding to the minimum exciting current. The motions in the armature are transferred to the mica diaphragm by the link. The head-band is of the self-adjustable type..... 12.00
- F3942. TELEPHONE RECEIVERS, Tunable, especially selected for electrolytic conductivity work.** They are so arranged that they may be tuned to the frequency of the testing current, thus assuring a maximum sensitivity in making measurements 20.00
- 10404. THERMOSTAT BATH, Cenco, Electrically Heated and Regulated, for use in physical chemistry laboratories which do not require a bath of as large size as our No. 10410 Aquarium Thermostat.**

The Cenco Thermostat Bath is made of a heavy gage of tinned copper, covered with an insulating material, supported upon a framework of angle iron welded at the corners to make a rigid support. The vertical corner pieces are extended to form the legs. The bottom is braced by cross rods to prevent sagging.

The heat is provided by a series of heating units of the Bureau of Standards "knife" pattern, having minimum temperature lag. A part of the wattage is controlled by a multiple point switch, the remainder being controlled by our automatic thermostat system, with which a precision of control of about 1/100°C. may be secured.

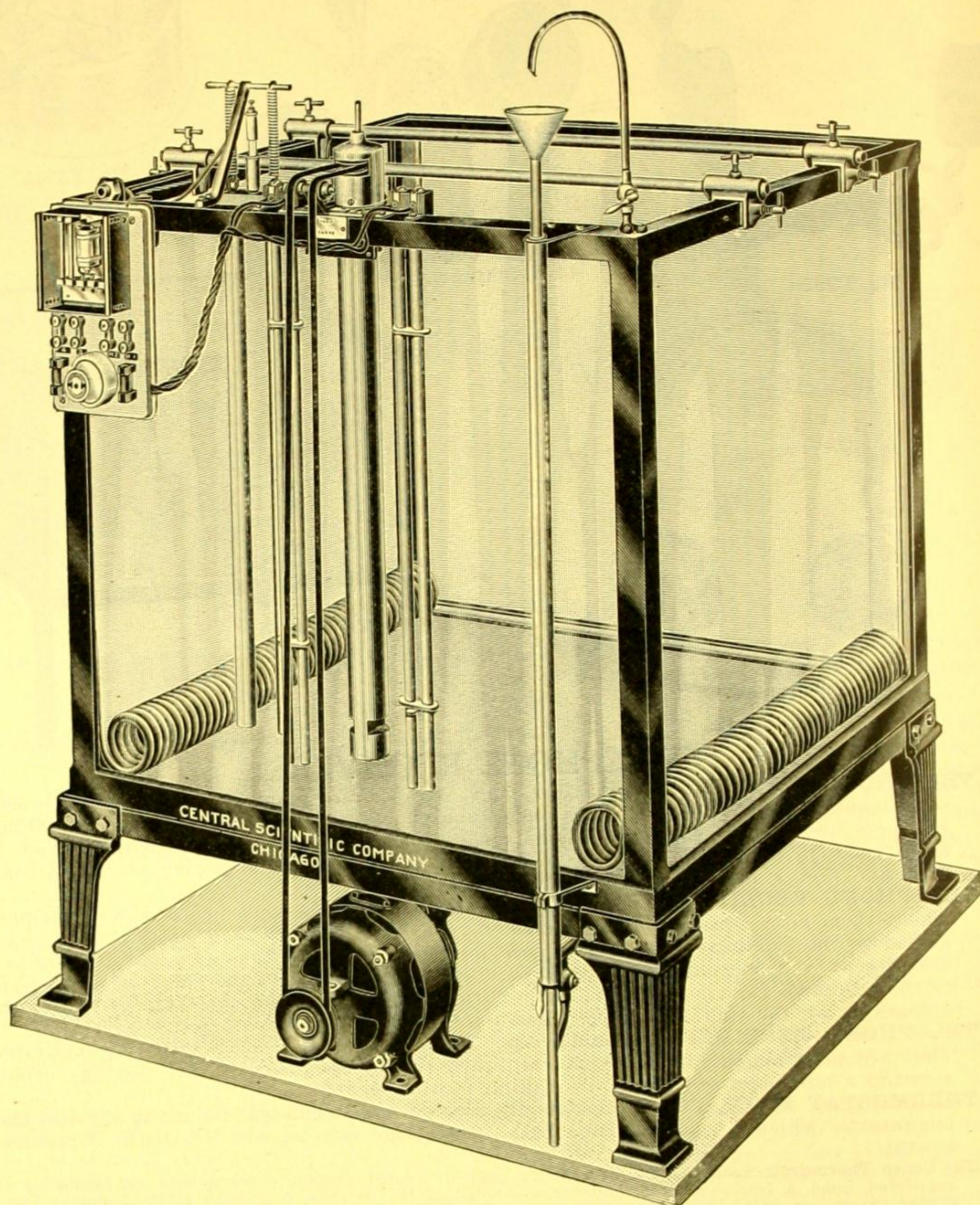
Stirring, upon which the uniformity of temperature distribution depends in a large degree, is accomplished very effectively by means of our motor-driven turbine stirrer, first introduced by us on our DeKhotinsky Water Baths.

Dimensions of Bath: Length, 80cm; width, 50cm; depth, 50cm; height over all, 80cm. Capacity, about 175 liters. Range of temperature, room temperature to 50°C. If it is desired to operate at or below room temperature, some method of cooling should be arranged. See our No. 10405 Cooling Coil below.

Complete as described with connecting cord and separable attachment plug.

No.	A B C D			
	A. C.		D. C.	
For volts	110	220	110	220
Each	\$350.00	350.00	350.00	350.00

- 10405. Cooling Coil for use with No. 10404 when it is necessary to maintain the temperature at or below low room temperature..... 35.00**



No. 10410.

Showing the De Khotinsky Aquarium Type Thermostat Bath, set up complete, ready for operation. This Thermostat is being used in the Physical Chemistry Laboratories of the University of Chicago and other leading universities with entire satisfaction. The illustration shows the large amount of space available for use and the unobstructed illumination from all sides.

10410. THERMOSTAT BATH, Aquarium Type, DeKhotinsky Electrically Heated and Regulated (Patented).

Fundamental Principles of Design

In the design of a Precision Thermostat Bath there are at least three elements of great importance to which the closest attention must be paid. First, there is the **Thermo-Regulator**, i. e., there must be ample motion of the regulator contact with temperature and response to temperature changes of the medium must be as rapid as possible. Second in importance are the **Heating Elements** which should be so arranged that the heat corresponding to the electrical energy input shall be given up to the bath liquid as quickly as possible after the current has been turned on, and that it shall cease as soon as possible after the current has been turned off. Third, the **Stirring** must be as rapid as possible so that there is thorough mixing of the heated liquid with the cooler liquid of the bath. A question of equal importance is the proper disposition within the tank of the regulator, the heaters, and the stirring device. If adequate attention has been given to these points, the maximum temperature excursion at any one point in the bath, as well as temperature differences between any two points in the bath, will be held at a minimum.

Changes in Design

At the time of going to press, a number of changes were being made in the DeKhotinsky Aquarium Thermostat with the purpose of further perfecting its performance—changes suggested after months of experimental work on the part of our development staff working in co-operation with Dr. Walter P. White of the Geophysical Laboratory. Due to the fact that the work was not completed at the time this was printed, we are unable to present a new illustration or a complete description giving these changes in detail. Complete information will be issued later in bulletin form. Our customers may be assured that all of the excellent features of the original model are retained and that the changes now in progress are a part of the work constantly being carried on in our development department to make this the most dependable and satisfactory constant temperature bath obtainable anywhere.

Description

The characteristic features of the DeKhotinsky Aquarium Bath which have become generally recognized for their excellence have been retained. These features are as follows:

Construction:—The bath is constructed of heavy plate glass cemented in a frame work of angle iron, with supporting legs of heavy cast iron bolted to the frame. The bottom is a plate of reinforced iron, covered with white porcelain enamel. The cement used to hold the glass sides is a special composition which remains plastic, preventing and possibility of leakage due to drying. Extensive experiments conducted at the University of Chicago have shown the lack of necessity for heat insulating material around a bath for use at temperatures from 10° to 60°C. For this reason, we have abandoned the old type of construction and have adopted the **aquarium** style of bath, because of its superiority in rendering the interior of the bath visible from any position and admitting light to every corner. The bath should be filled with distilled water to avoid the formation of deposits on the glass sides.

Stirring is accomplished by means of a turbine stirrer of nickel-plated brass, which takes water from the top of the bath at the rate of 200 liters per minute and delivers it at the bottom with an expenditure of energy of 60-75 watts. An extra pulley is provided at the top of the shaft to connect with stirrers in any apparatus placed in the bath.

Heating of the bath is effected by means of four electric heating units, having minimum temperature lag, connected in parallel, a part of them being automatically switched on and off by the relay. In order to maintain the temperature through warm weather or at temperatures below that of the room, two cooling coils are provided, made of nickel-plated brass tubing, of 6 mm inside diameter and 20 meters in length, which lie close to the sides and bottom of the bath, entirely out of the way. Through these coils may be passed city water or iced water to maintain the desired temperature.

Temperature control is secured by means of the DeKhotinsky precision thermo-regulator (patented), consisting of solid drawn steel tubes, properly protected from corrosion, and connected to a common head. To this is attached a glass capillary with regulating cap, by which the platinum point may be raised and lowered to change the temperature setting. Coarse regulation may be effected by turning the knurled screw by which the capillary is attached to the regulator head, thus raising or lowering the mercury level. All parts are so proportioned as to secure a regulation of 0.005°C., or better. The regulator is far more sensitive than a Beckmann thermometer. To eliminate vibration of the mercury surface in the capillary chamber, the thermo-regulator is suspended by two springs. The thermo-regulator is in circuit with a sensitive relay, with multiple contacts, the opening and closing of which makes and breaks the current through the regulating units.

Whatever changes may be made, our friends may feel assured that every detail of design will be most carefully investigated, that all of the parts will be constructed with the greatest care, and that the final design will represent a thermostat bath that will perform better, and at the same time with less attention, than any similar bath that has been hitherto offered to users of such apparatus. In the meantime we shall be pleased to take orders for this bath with the understanding that our usual unqualified guarantee of satisfaction applies to this bath as it does to all apparatus and instruments of our manufacture. Complete as described with heating units, thermo-regulator, relay, turbine stirrer with motor for operation, two nickel-plated brass support rods with two clamps each, and five feet of cord and separable attachment plug.

Length, 71 cm.

Height from floor, 80 cm.

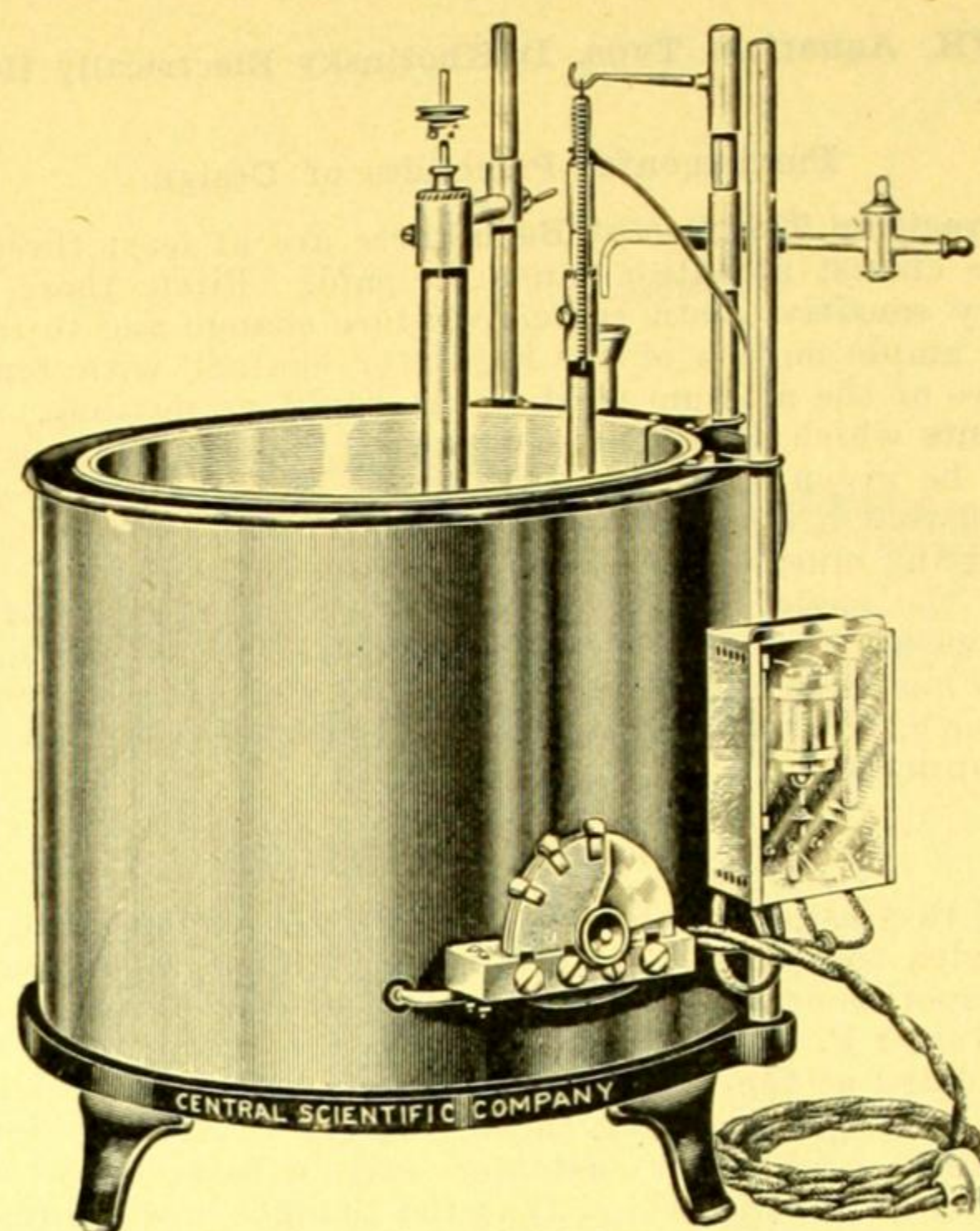
Depth, 61 cm.

Width, 71 cm.

Capacity, 300 liters.

No.	A	B	C	D
	A.C.		D.C.	
For volts	110	220	110	220
Each	\$500.00	500.00	500.00	500.00
			each	2.50

10411. Rod Clamps for use with No. 10410.



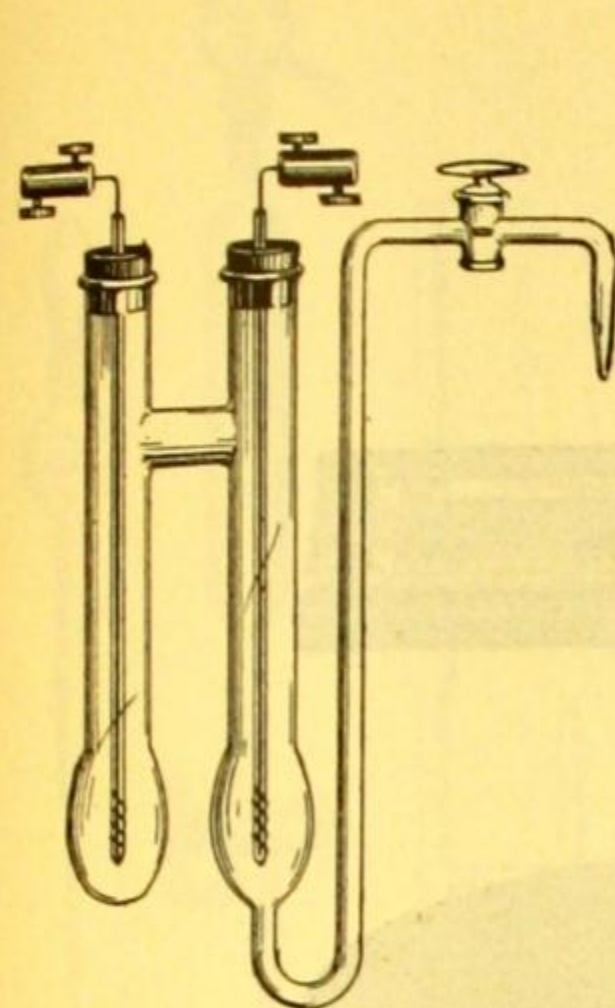
Nos. 14300-3.

THERMOSTAT BATH, DeKhotinsky, Electrically Heated and Regulated (Patented), intended for use in physico-chemical work, where constant temperature to $\frac{1}{10}^{\circ}\text{C}$. is required. It consists of a copper container $\frac{3}{4}$ mm ($\frac{1}{32}$ inch) in thickness, heavily nickel-plated inside and out, lagged with 25 mm (1 inch) magnesia-asbestos (magnesia 85%), and protected outside by a sheet of Russia iron. The bath is attached to an enameled cast-iron base, supplied with three nickel-plated rods, to which may be attached laboratory clamps for supporting flasks, etc. Each bath is fitted with four electric heating units, three of which may conveniently be added one by one, by means of the switch constituting part of the bath. The fourth unit is electrically connected to the relay, which is automatically operated by a thermo-regulator. The thermo-regulator consists of a solid drawn-steel tube, brass covered, nickel-plated, filled with mercury, with a platinum contact attached to a regulating cap, by means of which the bath can be regulated and set to the desired temperature, ranging from the temperature of the surrounding atmosphere to 165°C ., or even higher. For temperatures above 60°C ., to prevent rapid cooling by evaporation, we recommend the use of liquid petrolatum, and for temperatures above 110°C ., Crisco. For temperatures within 2 degrees of room temperature and lower, No. 14306 Cooling Coil must be used. With this bath, when provided with a No. 12864 High Speed Turbine Stirrer, the temperature can be held constant to $\frac{1}{10}$ degree C ., over long periods of time. Vigorous circulation is essential to close regulation in any water bath.

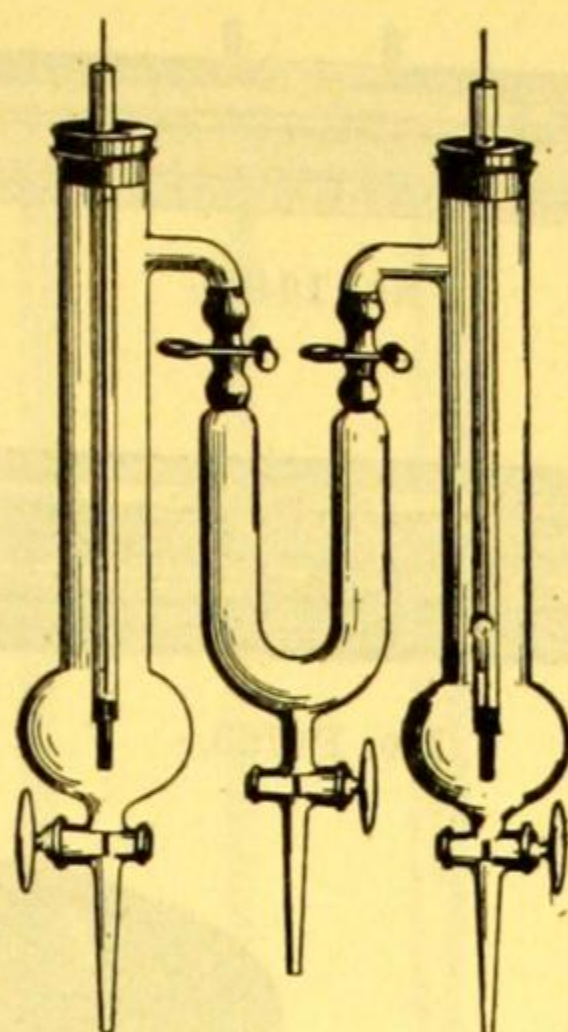
A constant water level attachment is furnished with each bath, by means of which the water level can be regulated within a range of 35 mm ($1\frac{1}{2}$ inch) and maintained within 1 mm of the level at which it is set. This bath has a very good natural circulation, as heat is supplied inside the bath 25 mm from the bottom. For the best results, however, High Speed Turbine Stirrer No. 12864 must be attached to the bath. This stirrer of 18 mm diameter takes water from the bottom of the bath at the rate of five liters per minute, and delivers it at the top with an energy expenditure in the motor of 15 watts. On the shaft of the circulation turbine is an extra pulley to connect with glass stirrers in vessels suspended in the bath. Complete with four heating units, relay, thermo-regulator, constant water-level device, support rods, five feet of cord and attachment plug. **If uniformity of temperature throughout bath is desired, stirrer should be included.**

No.		A	B
	Capacity, liters	9.3	18.25
	Diameter inside, cm.	25	30.5
	Available height inside, cm.	19	25
14300.	For 110 volts A. C.	\$125.00	135.00
14301.	For 220 volts A. C.	125.00	135.00
14302.	For 110 volts D. C.	125.00	135.00
14303.	For 220 volts D. C.	125.00	135.00
14306.	Cooling Coils for Nos. 14300-3.	12.00	15.00
12865.	Stirrers, High Speed Turbine for Nos. 14300-3	12.00	12.00

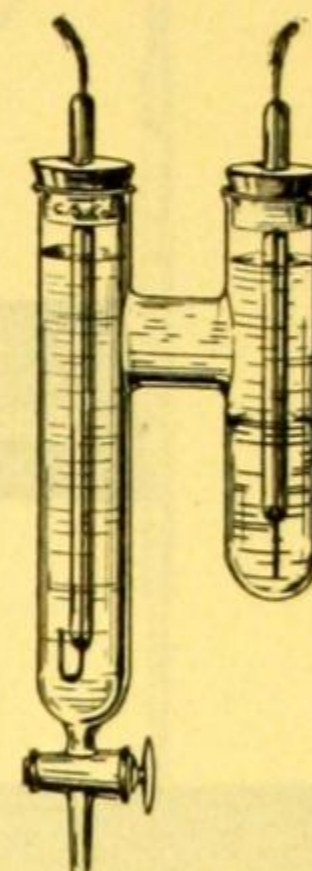
Note:—In ordering water baths state mean temperature desired, so that heating units of correct wattage may be furnished.



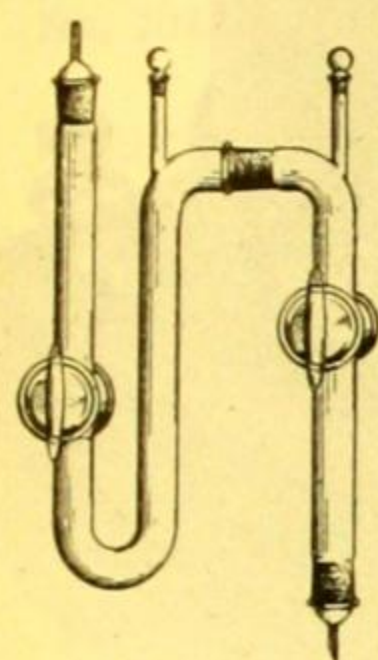
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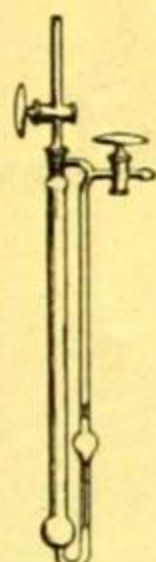
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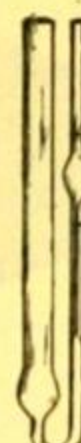
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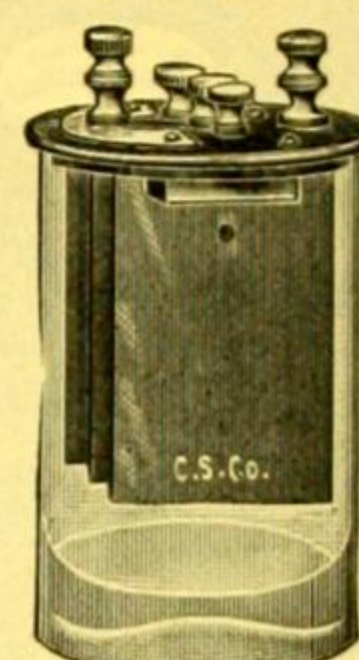
No. 10418.



No. 10420.



No. 10422.



No. F5101.

TRANSPORT (TRANSFERENCE) OR MIGRATION NUMBER APPARATUS

10414. **TRANSPORT (TRANSFERENCE) TUBE**, with silver and copper electrodes sealed in glass tubes, inserted in rubber stoppers. With glass stop-cock..... \$6.00
10415. **TRANSPORT (TRANSFERENCE) TUBE**, Findlay, with silver electrodes cemented in glass tubes inserted in rubber stoppers, with detachable U tube and three glass stop-cocks for withdrawing liquid for analysis. (See Findlay's Practical Physical Chemistry, page 211) 14.00
10416. **TRANSPORT (TRANSFERENCE) TUBE**, Loeb and Nernst, for silver salts, with cathode of silver foil and anode of silver wire in a flat spiral, in glass tubes inserted in rubber stoppers. With stop-cock at bottom for withdrawing solution for analysis. See Findlay's Practical Physical Chemistry, page 207)..... 4.00
10418. **TRANSPORT (TRANSFERENCE) TUBE**, Washburn, for the study of hydration of ions, etc. Complete as illustrated with two stop-cocks with bore equal to that of the tube, ground in glass plugs at the ends, ground joint in the middle and sealed on tubes for obtaining samples to be analyzed, with ground in stoppers. **Without electrodes.** (See Journal of American Chemical Society, Vol. XXXI, for 1909, page 322) 33.00

VAPOR DENSITY APPARATUS, see general heading Vapor Density Apparatus.

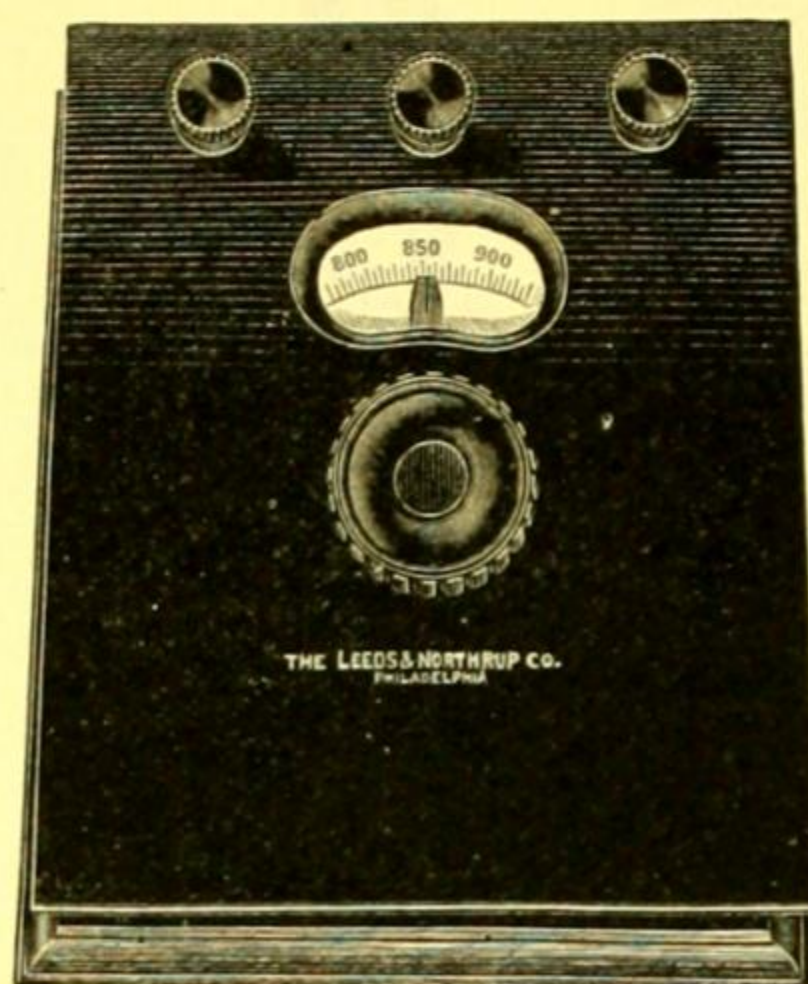
10420. **VISCOSITY PIPETTE**, Drucker, with glass stop-cocks. Time of outflow, 80 to 100 seconds 7.25
10422. **VISCOSITY PIPETTE**, Ostwald, with time of outflow 80 to 100 seconds..... 1.10
- F5101. **VOLTAMETER, Copper**, new construction. Consists of a glass jar in which are suspended three copper plates, two loss plates and one gain plate, each of about 40 square centimeters area. These plates are held by an ingenious clamping device and their construction is such that they may be handled without touching with the fingers..... 4.00
- F5102. **VOLTAMETER, Silver**, same construction as No. F5101, with detachable silver plates.. 7.50



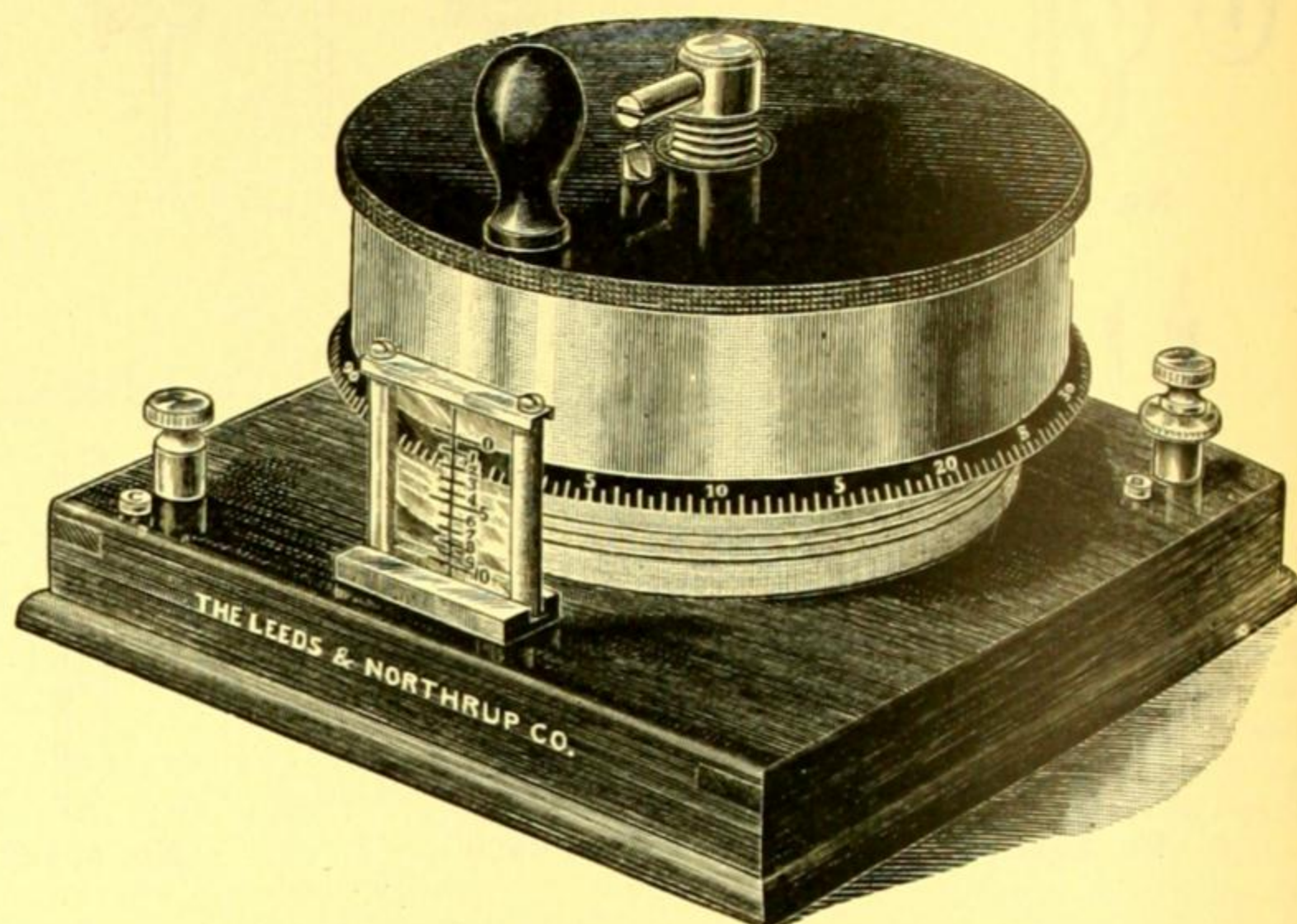
No. 10436.



No. F4763.



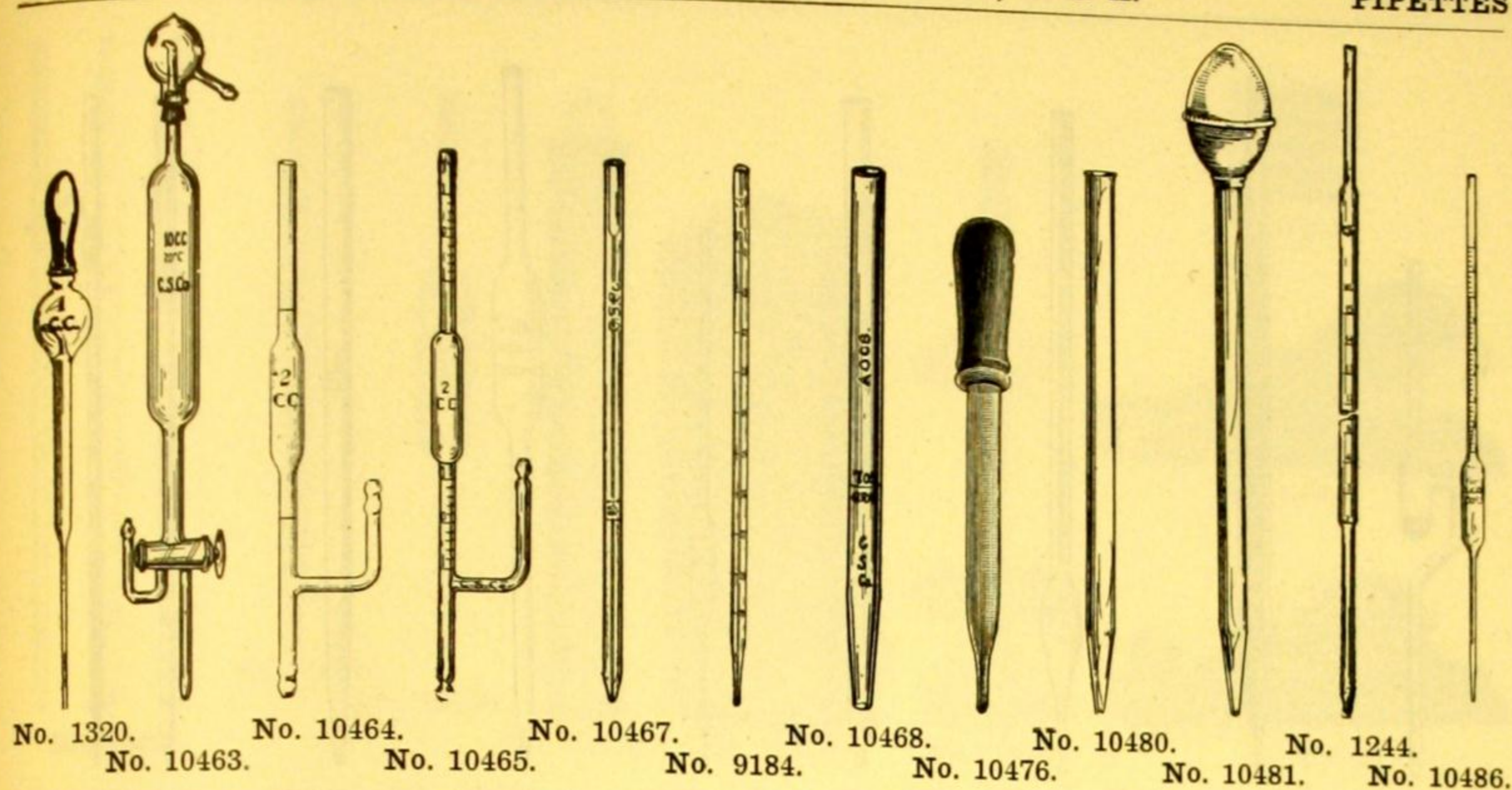
No. 10438.



No. 10440.

- F4763. **WHEATSTONE BRIDGE, Standard Slide Wire Form** of simple construction. A resistance wire one meter long is mounted on a scale graduated in millimeters, and provided with a sliding knife edge contact. The strips are of brass with no soldered joints and provided with a single gap in each of two arms of the bridge for known and unknown resistance. Complete with necessary binding posts and full directions, on finely finished hardwood board, 12.5x110 cm. \$6.00
10436. **WHEATSTONE BRIDGE for Conductivity Measurements, Extended Coil Type**, as developed at the University of Illinois. The bridge is of the usual slide wire form with a half meter scale graduated on the upper half from 475 to 525 cm and on the lower half from 0 to 50 cm in 0.1 cm divisions. A wire of very low thermal coefficient but of high resistance is stretched over the scale, and a sufficient amount is wound on two spools, placed at the ends, to make 1000 cm of total length, exactly divided as to resistance. By means of removable plug contacts, the bridge may be used either as a half-meter or as a ten-meter bridge. In this way the resistance of a solution may be approximately determined on the half-meter scale, the plugs then removed and the exact point determined on the ten-meter scale. By using this bridge, readings can be readily made with an accuracy of 0.01 of 1 per cent. 40.00
10438. **WHEATSTONE BRIDGE, Kohlrausch Slide Wire, L. & N. simple form**, with all metal parts enclosed and protected from corrosion. The slide wire has a resistance of 20 ohms and is wound on a drum having a graduated dial reading from 0 to 1000. Extension coils having a resistance of 90 ohms are provided at each end of the slide wire, which may be connected in the circuit as desired, making the total resistance 200 ohms. 60.00
10440. **WHEATSTONE BRIDGE, Kohlrausch Slide Wire, L. & N. precision type**, consisting of 470 cm of wire, having a resistance of about 27 ohms, wound in ten turns on a marble cylinder 15 cm in diameter. A hood revolving on a threaded spindle contains a specially designed contact point which follows the resistance wire without wear upon it. The position of the contact is determined by reading the number of whole turns from zero on the vertical glass scale mounted in front of the revolving hood and the fraction of a turn from the scale, divided into 100 parts by $\frac{1}{2}$ parts, on the periphery of the revolving hood. It is possible to estimate the position of the contact to 1 part in 10,000 of the slide wire or 1 part in 100,000 of the ratio arm, as extension coils are provided at the ends of the slide wire making the total resistance of the system 10 times that of the slide wire above. 125.00

For other **WHEATSTONE BRIDGES**, see general heading, **Electrical Instruments**.



PICKS, Mineralogical, see Hammers.

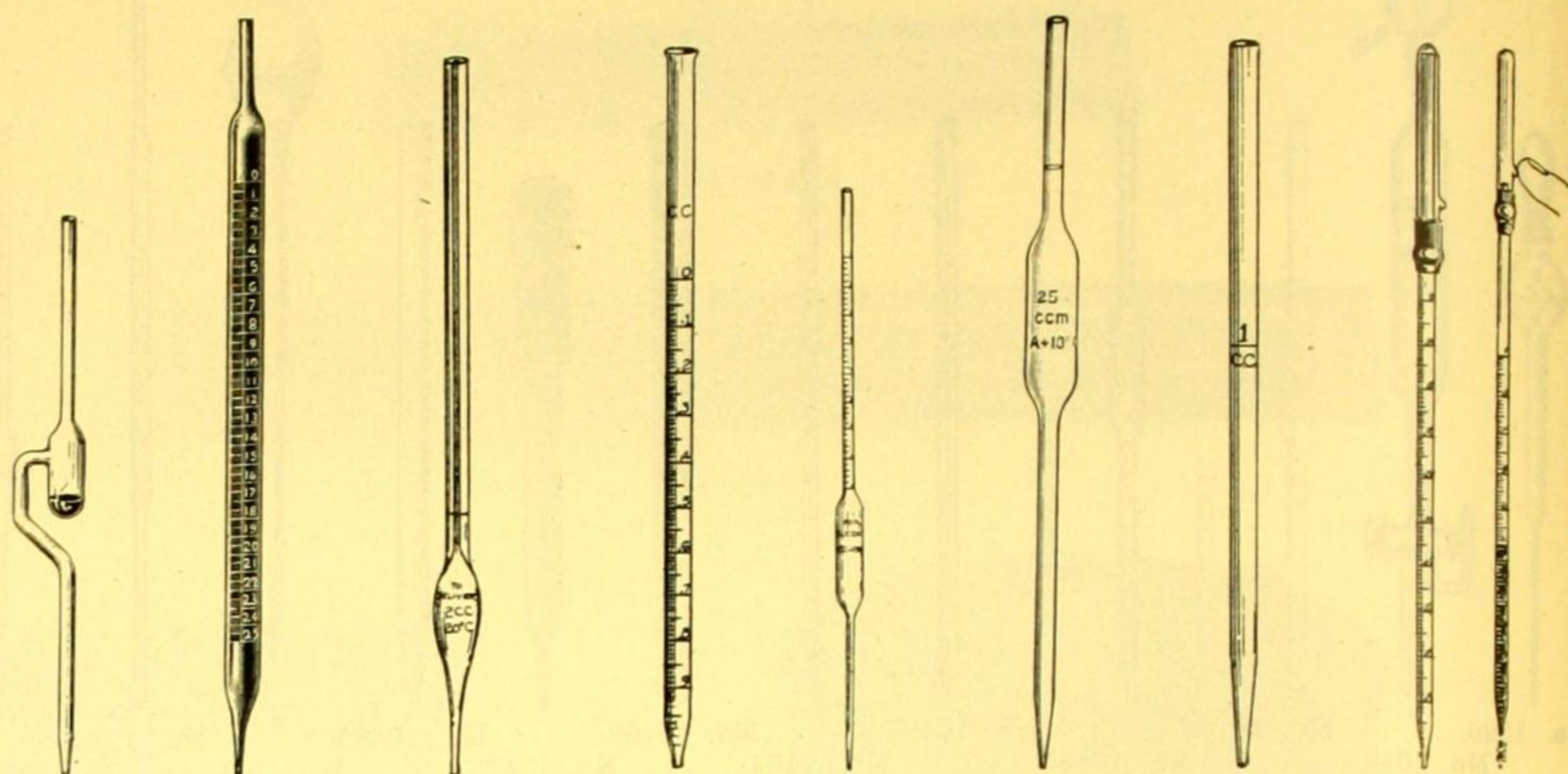
PILL BOXES, see Boxes.

PINS, Insect, see Insect Pins.

10448. PINS, ordinary, stiff and sharp pointed, in $\frac{1}{2}$ pound boxes.....Per box \$0.90
10454. PIPES, ClayPer dozen .50

PIPETTES

1320. **PIPETTE, Automatic Dropping**, with rubber bulb, for delivering exactly 1 cc, with reservoir to hold excess. Convenient for filling ampoules 1.30
10463. **PIPETTES, Automatic Overflow**, with three-way stop-cock and reservoir for holding excess.
Capacity, cc..... 10 25 50 100
Each 2.70 3.50 4.00 4.50
- PIPETTES, Blood Diluting or Mixing**, see under general heading **Blood Testing Apparatus**.
10464. **PIPETTES, Calibrating, Ostwald**, with two marks.
Capacity, cc..... 2 5
Each 1.00 1.20
10465. **PIPETTE, Calibrating**, capacity, 2cc; graduated to $\frac{1}{10}$ cc in $\frac{1}{50}$ cc divisions above and below the bulb..... 1.75
10467. **PIPETTE, Capillary, Breed and Brew**, for preparing milk smears on microscope slides for counting the bacteria present. Graduated at $\frac{1}{100}$ cc. With a 6.4 ocular and a 1.9 mm objective (oil immersion), a 195 mm tube furnishes an apparent field of $\frac{1}{5000}$ square cm. (See Circular No. 58 of the New York Experiment Station.) 1.00
9184. **PIPETTE, Capillary, Frost's**, for use in counting bacteria in milk by the Frost "little plate" method. Capacity, $\frac{1}{10}$ cc; graduated to $\frac{1}{100}$ cc..... .50
10468. **PIPETTE, Cottonseed Oil**, graduated to deliver 7.05 grams of crude cotton seed oil at 20° C. Recommended for the analysis of fatty acids in cottonseed oil by the American Oil Chemists' Society50
10476. **PIPETTES, Dropping, Medicine Droppers**, with rubber bulb. Length, 4 inches; capacity, about 2 ccPer dozen .25
10% discount in lots of 12.
10477. **PIPETTES, Dropping**, same as No. 10476, but with tip curved.....Per dozen .25
10% discount in lots of 12.
10480. **PIPETTES, Dropping, straight**, without bulb.
Length, inches 8 12
Each09 .10
10% discount in lots of 12.
10481. **PIPETTES, Dropping**, same as No. 10480, but with rubber bulb of 25 cc capacity.
Length, inches 8 12
Each25 .28
(Other lengths will be made to order.)
10% discount in lots of 12.
- PIPETTE ELECTRODE**, see general heading **Physical Chemistry Apparatus**.
1244. **PIPETTE, Folin-Wu**, for use in the preparation of protein free blood filtrates. Graduated from tip to 15 cc by 1 cc divisions. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 81.)50
- PIPETTES, Gas**, see **Gas Analysis Apparatus**.
10486. **PIPETTE, Glucose, Spencer's**, capacity 50 cc, graduated from 5° to 20° on the Brix scale in $\frac{1}{5}$ ths 1.80



No. 10490. No. 10496. No. 10502. No. 10506. No. 10510. No. 10514. No. 10516. No. 10520.

10490. **PIPETTE, Mercury**, for taking up drops without danger of drawing them into the mouth. .45
10% discount in lots of 12.

PIPETTES, Milk and Cream Test, see general heading **Milk and Butter Testing Apparatus**.

10496. **PIPETTES, Mohr's**, accurately graduated in cc and fractions.

No.	A	B	C	D	E	F	G	H
Capacity, cc.....	$\frac{1}{10}$	1	1	2	5	10	20	25
Graduated to, cc.....	$\frac{1}{100}$	$\frac{1}{100}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
Each	.29	.29	.27	.27	.27	.29	.42	.42

10% discount in lots of 12, 20% discount in lots of 72.

10502. **PIPETTES, Ostwald-Folin**, as used in Folin's method for the determination of total nitrogen, urea and ammonia in urine, and in the methods of various biochemists for other determinations upon body fluids. The capacity indicated is the volume delivered when the pipette is entirely emptied. (See Folin and Wu: Journal of Biological Chemistry, 1919, xxxviii, 81.)

Capacity to deliver, cc.....	1	2	3	5
Each	.55	.58	.67	.70

10506. **PIPETTES, Serological**, similar to No. 10496, but graduated to the extreme tip.

No.	A	B	C	D	E
Capacity, cc	$\frac{1}{10}$	1	1	5	10
Graduated to, cc.....	$\frac{1}{100}$	$\frac{1}{100}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
Each	.29	.29	.27	.27	.29

10% discount in lots of 12, 20% discount in lots of 72.

10510. **PIPETTE, Sucrose**, capacity 52.096 cc, graduated from 5° to 25° on the Brix scale in 1/10ths 2.00

PIPETTE, Viscosity, see Nos. 10420-2.

10514. **PIPETTES, Volume or Transfer**, with bulb approximately in middle of tube.

Capacity, cc	1	2	5	10	20	25	50	100	200
Each	.20	.20	.20	.25	.35	.35	.47	.55	.78

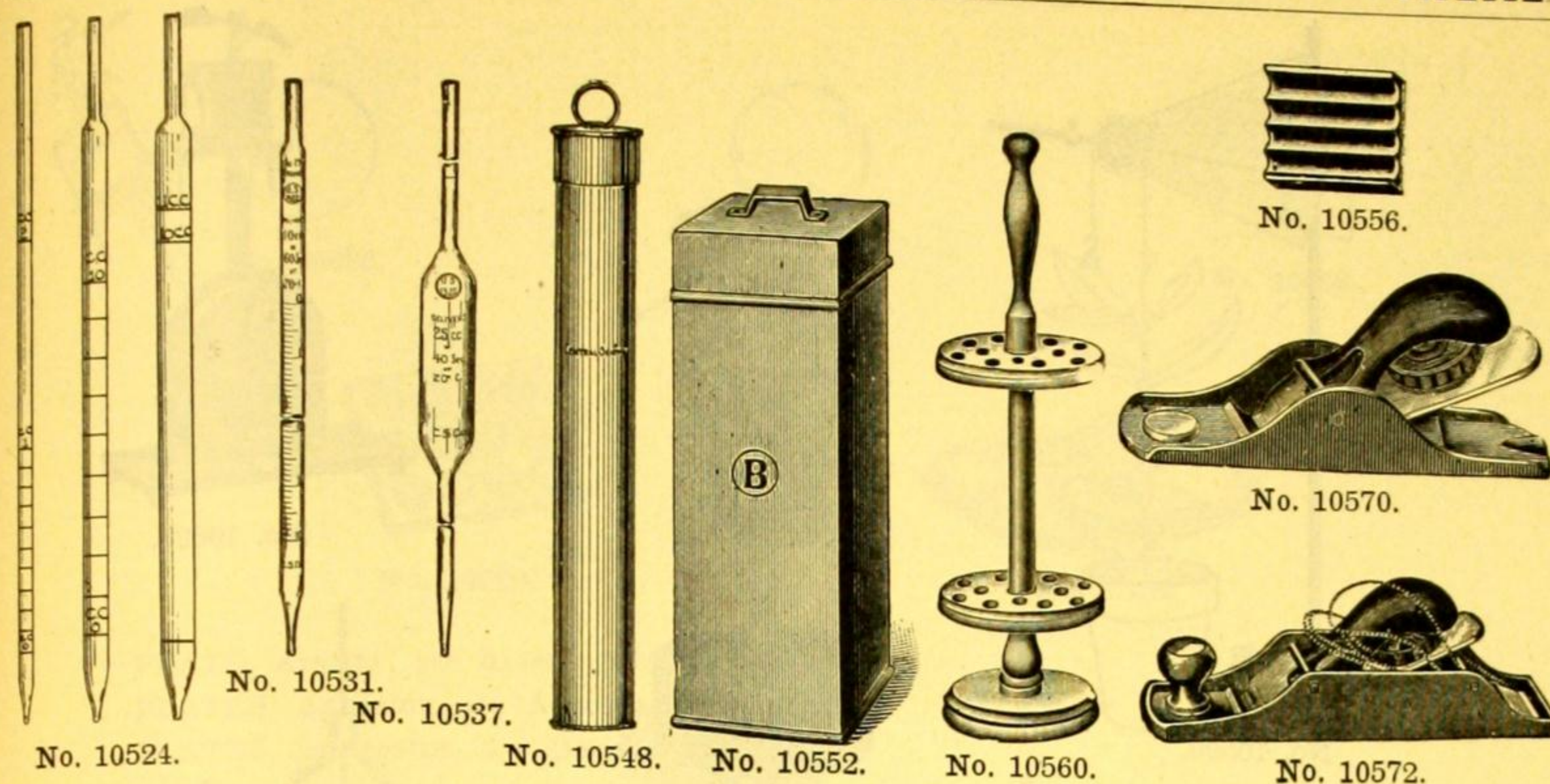
10% discount in lots of 12, 20% discount in lots of 72.

10516. **PIPETTES, Volume or Transfer**, without bulb, as used in bacteriological work and water analysis.

Capacity, cc	1	5	10
Each	.20	.20	.35

10% discount in lots of 12, 20% discount in lots of 72.

10520. **PIPETTE, Wassermann Safety**, for bacteriological and serological work, designed to prevent any danger of infection in handling samples. Sliding the glass cap upward with tubulation closed by the finger fills the pipette. Delivery is controlled by the finger. Graduated from the tip to 1/10 cc in 1/100ths. .75



10524. **PIPETTES, Water Analysis**, as used in the Hygienic Laboratory of the United States Public Health Service. Set consists of three pipettes; one 11 cc pipette graduated at 0, 10 and 11 cc; one 10 cc pipette graduated from 0 to 10 cc in single cc; and one 2 cc pipette graduated from 0 to 1 cc in 1/10ths and with mark at 2 cc.

Capacity, cc	2	10	11
Each	\$0.35	.35	.35

10% discount in lots of 12, 20% discount in lots of 72.

PIPETTES, Weighing, see **Bottles, Weighing**.

PIPETTES, PRECISION OR NORMAL

The precision pipettes listed here are the products of manufacturing establishments with whose methods of calibration and standardization we are thoroughly familiar. We believe those without certificate to be as reliable as any obtainable. We strongly recommend, however, that every analytical laboratory purchase at least one set of pipettes which has been tested by the Bureau of Standards by which to check their uncertified standards.

10530. **PIPETTES, Mohr's, Precision or Normal**, graduated at 20° C., to meet the requirements of the United States Bureau of Standards.

No.	A	B	C	D	E	F
Capacity, cc	1	1	5	10	25	50
Graduated to, cc	1/100	1/10	1/10	1/10	1/10	1/10
Each	\$1.60	1.30	2.20	2.60	3.00	3.60

10531. **PIPETTES, Mohr's, Standard**, same as No. 10530 but standardized by the United States Bureau of Standards. **With control stamp and certificate of correction.**

No.	A	B	C	D	E
Capacity, cc	1	1	5	10	25
Graduated to, cc	1/100	1/10	1/10	1/10	1/10
Each	4.60	4.30	5.20	5.60	7.00

10536. **PIPETTES, Volumetric, Precision or Normal**, graduated at 20° C., to meet the requirements of the United States Bureau of Standards.

Capacity, cc	1	2	5	10	25	50	100
Each	.60	.70	.80	.90	1.10	1.30	1.80

10537. **PIPETTES, Volumetric, Standard**, same as No. 10536, but standardized by the United States Bureau of Standards. **With control stamp.**

Capacity, cc	1	2	5	10	25	50	100
Each	1.60	1.70	2.00	2.10	2.40	2.60	3.20

PIPETTE BOTTLES, see general heading **Bottles, Dropping**.

10548. **PIPETTE BOX**, cylindrical, for use in sterilizing pipettes, of sheet copper, with tightly fitting cover with handle. Length, 15 inches; diameter, 2 inches. Size, 2.00

10552. **PIPETTE BOX**, rectangular form, of sheet copper, with overhanging cover with handle. Size, 3.00

PIPETTE BRUSHES, see general heading **Brushes**.

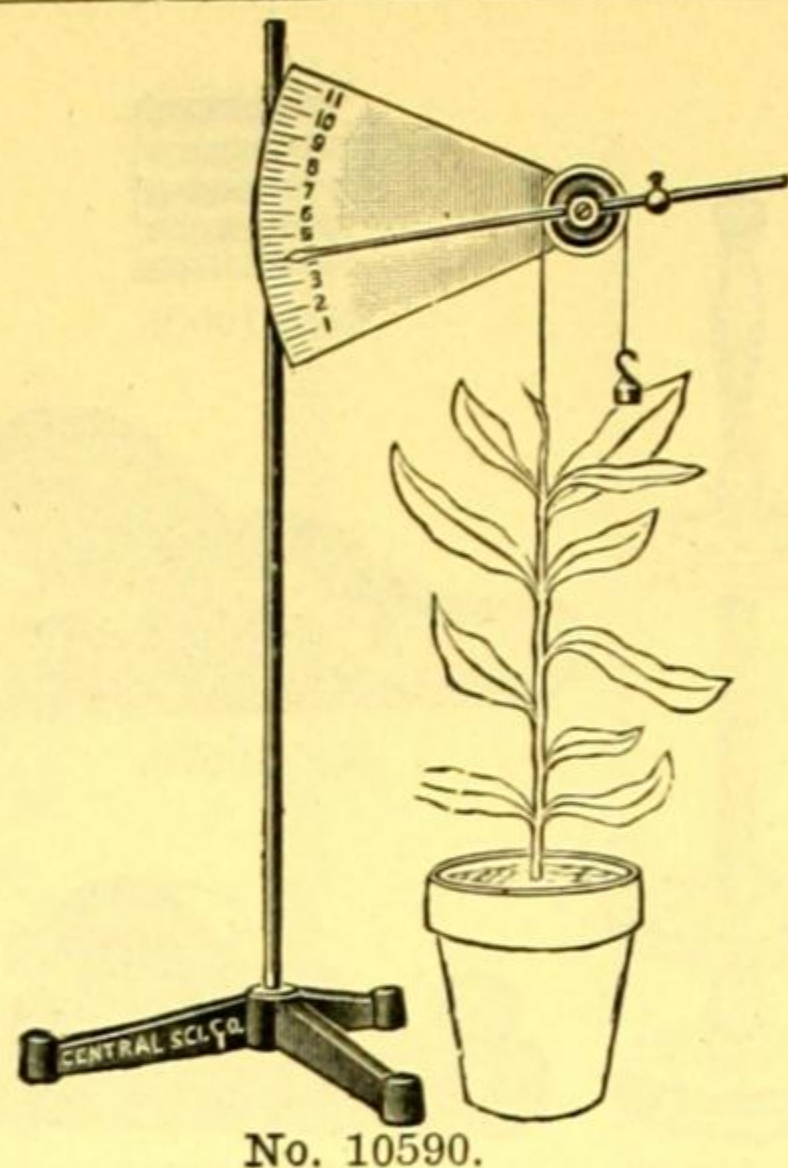
10556. **PIPETTE REST**, of porcelain. .60

10560. **PIPETTE SUPPORTS**, of hardwood, revolving, for 12 pipettes. 3.00

PITCHERS, Acid, see **Acid Pitchers**.

10570. **PLANE, Block**, iron, 5 1/2 inches long, 1 1/4-inch cutter. 1.10

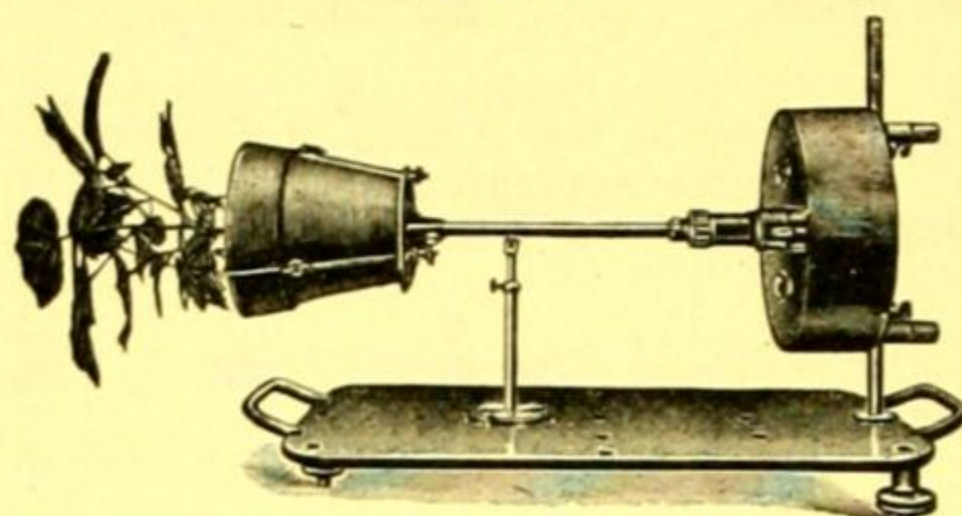
10572. **PLANE, Double End**, iron, 8 inches long, 1 3/4-inch cutter. This plane may be used as a block plane, or by reversing the cutter and wedge it can be used to plane close up into corners or other difficult places. 1.80



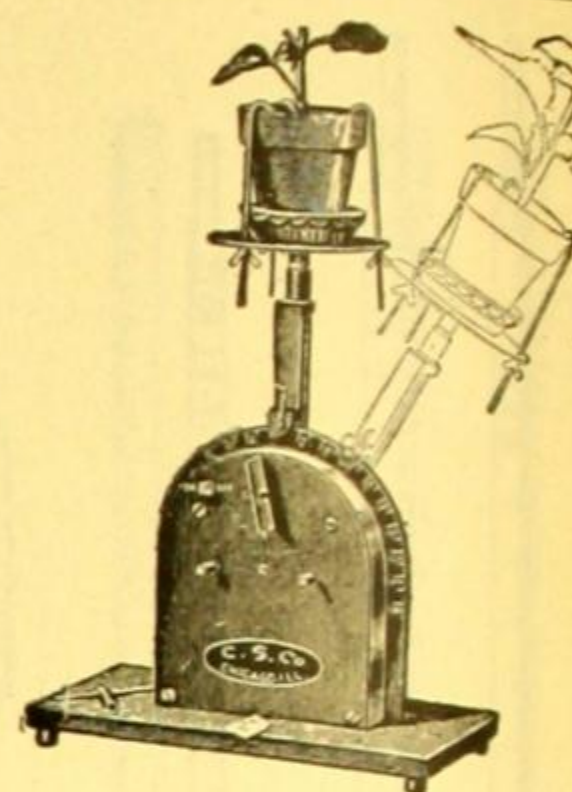
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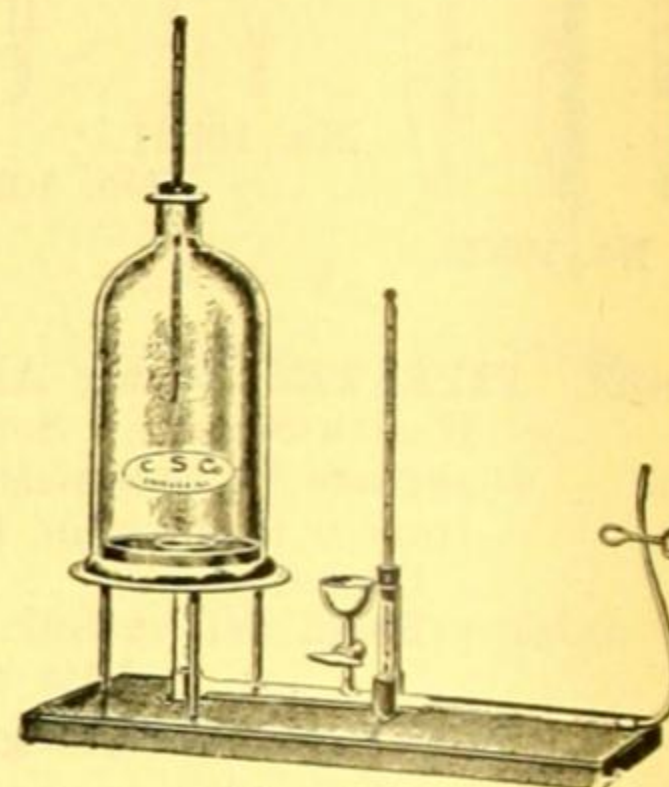
No. 10606 (shown in vertical position).



No. 10606 (shown in horizontal position).



No. 10608.



No. 10636.

PLANT PHYSIOLOGY APPARATUS

10590. **AUXANOMETER**, a simple and practical apparatus for measuring plant growth. A silk thread attached to the plant passes over a pulley with which it is held in close contact by a weight. This pulley moves freely and the pointer attached to it is provided with a counterbalance. The scale is accurately divided, each division representing a growth of .01 inch, and may be placed at any desired height on the support rod \$6.75
10606. **CLINOSTAT**, for investigations involving plants of moderate weight where great precision of revolution is not required. It consists essentially of the works of a powerful eight-day clock, geared to a revolution in fifteen minutes and enclosed in a practically dust and moisture-proof case, 16 cm in diameter. A ball-bearing shaft takes the strain from the works, which are started and stopped by a cylindrical nut projecting from the upper surface. It is to be wound, not too tightly, once in two days, which may be accomplished without disturbing the plant. Properly used it will carry a 4-inch or smaller pot horizontally, or a larger size vertically. As with clinostats, however, it revolves with greater evenness the smaller the weight it has to carry, and consequently the smallest pots allowed by the subject under study should be used. The size with which the instrument works best is the three-inch, this size, however, being larger than commonly supposed, since the measurements of pots are all internal. Complete as described with directions for use \$4.50
10608. **CLINOSTAT, Adjustable**, intended for use in laboratories of Botany and Plant Physiology which require an instrument superior in design and construction to our No. 10606. The special features of design are:
 (1) The adjustable arm, and
 (2) The variable speed of rotation
 With the adjustable arm, the plant table can be set at any angle from 0° to 180° and securely locked in place at each position. Each five degree interval is marked but settings to one degree can be readily made. The three rotating spindles are provided with gears, any one of which may be thrown into mesh with the gear driving the table, causing the latter to be rotated at a speed of one revolution in 10, 15, or 20 minutes, according to the gear used. Intermediate speeds may be obtained by the use of the smaller regulating fan. The instrument will carry a load of 10 pounds and run for 17 hours without winding. The instrument is well made, with all parts accurately fitted, and is beautifully finished in lacquered brass and polished japan.
 Complete with winding key, clamps for holding flower pot on the rotating table, and two regulating fans \$5.00
10636. **POTOMETER, Universal**, for use in investigations of the effect of various external conditions upon the transpiration rate of plants. With this apparatus practically every known condition affecting transpiration can be produced and varied or maintained at will. The apparatus consists of a bell jar supported upon a circular plate, cemented to the opening in which is a glass tube ending in a graduated capillary and provided with a reservoir with glass stop-cock. The plate upon which the bell jar rests is shaped to form a circular tank in which water or hot sand may be placed. By means of thermometers, the temperature of both the air in the jar and the water in the tube may be taken. Gases may be drawn into the jar through the tubulature, or wet and dry bulb thermometers may be inserted in it. The small diameter of the capillary, which is accurately graduated to 0.01 cc, makes the instrument very sensitive. Complete as described with bell jar, two thermometers and pinch clamp, on polished wooden base \$14.50



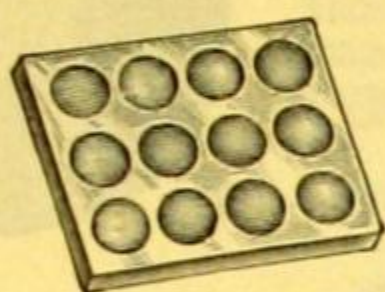
No. 10686.



No. 10692.



No. 10696.



No. 10720.



No. 7316.

PLATE, Arsenic, see Arsenic Plate.

PLATES, Asbestos, see Asbestos Pads.

PLATES, Desiccator, see Desiccators.

10686.	PLATES, Glass, circular, for covering beakers, dishes, etc. Edges not ground.				
	Diameter, mm	80	100	120	150
	Each	\$0.05	.07	.10	.12

10% discount in lots of 10, 20% discount in lots of 100.

10692.	PLATES, Glass, circular, same as No. 10686, but with hole at side for stirring rod.				
	Diameter, mm	60	80	100	120
	Each	.22	.25	.32	.40

10% discount in lots of 10, 20% discount in lots of 100.

10696.	PLATES, Glass, square, for covering jars, beakers, etc. Edges not ground.				
	Length of side, mm	50	75	100	150
	Each	.05	.07	.08	.10

10% discount in lots of 10, 20% discount in lots of 100.

10698.	PLATES, Glass, square, same as No. 10696, but of double thick glass and ground on one side. Edges not ground.				
	No.	A	B	C	D
	Length of side, mm	50	75	100	150
	Each	.05	.08	.10	.20

10% discount in lots of 10. 20% discount in lots of 100.

10702.	PLATES, Glass, heavy plate, square, ground rough on one side, with edges slightly ground. For use with bell jars, etc.				
	Length of side, mm	100	125	150	200
	Each	.25	.45	.50	.60

10% discount in lots of 10.

10708.	PLATES, Glass, blue cobalt, rectangular, for flame tests.			
	Size, mm	50x50	75x75	100x100
	Each	.08	.12	.22

10% discount in lots of 10. 20% discount in lots of 100.

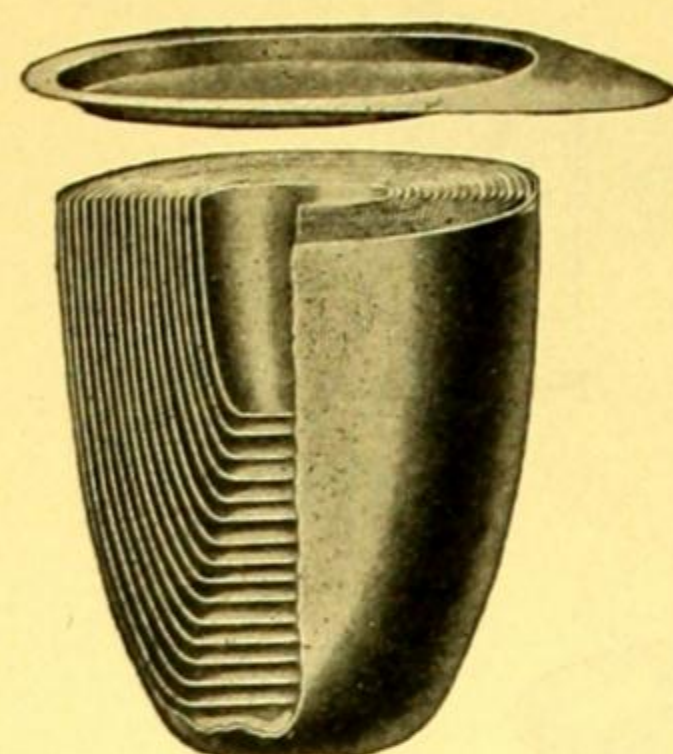
F7151.	PLATES, Glass, colored, of best pot glass, 10 cm square. Colors as near spectral as possible to produce. Edges not ground.						
	No.	A	B	C	D	E	F
	Color	violet	indigo	blue	green	yellow	orange
	Each	.22	.22	.22	.22	.22	.22

10% discount in lots of 10.

PLATES, Hot, see Hot Plates.

PLATES, Porcelain Filter, see Filter Disks No. 5366.

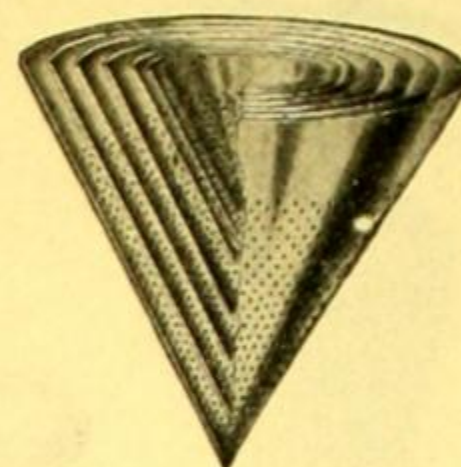
10720.	PLATE, Porcelain, for color reactions. Size 90x110 mm, with 12 concavities.	.80
10726.	PLATE, Porcelain, glazed, square, 5½x5½ inches	.40
	PLATE, Porcelain Streak, see Arsenic Plate.	
7316.	PLATE, Porous Clay, dinner plates, for quickly drying precipitates and crystals. Diameter, 9¾ inches	.25



No. 10756.



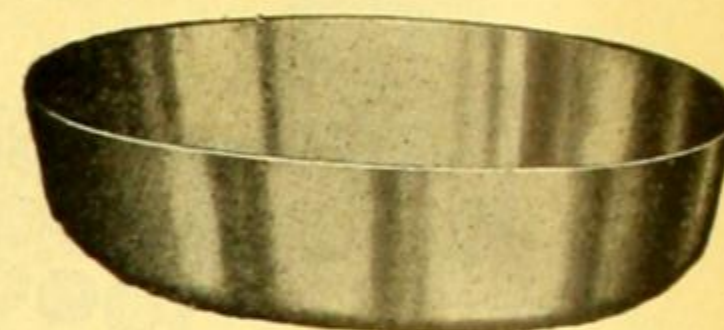
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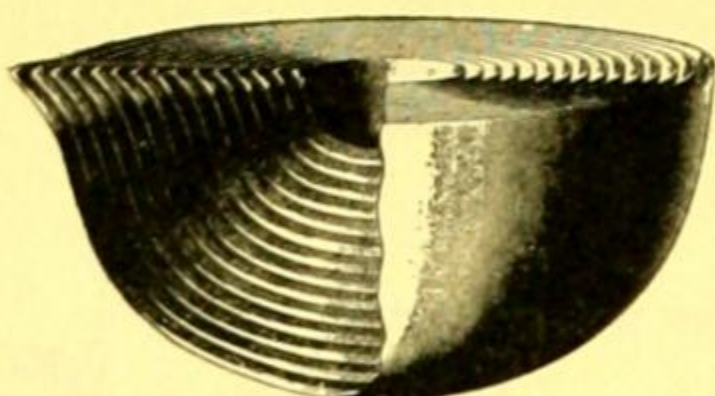
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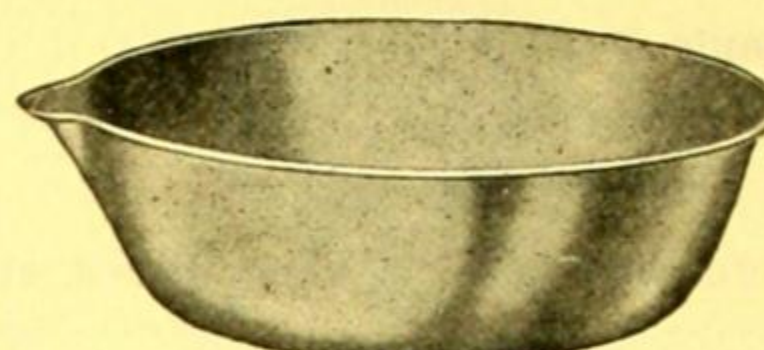
No. 10788.



No. 10798.



No. 10772.



No. 10784.



No. 10800.

PLATINUM WARE

Our platinum ware is warranted pure and of the most approved shapes. Dishes and crucibles are all hammered and thoroughly tested after being finished. We carry in stock only those forms for which there is the greatest demand. All others furnished shortly after receipt of order. Special shapes and designs will be made to order. Platinum ware will be sent only by registered U. S. mail. We advise that scrap platinum sent in for credit or exchange be shipped in the same manner. Old or scrap platinum is bought at the market price. Weights given below are approximate only.

Prices will be governed by the Market Price of Platinum.

1455. **BLOWPIPE TIP**, Platinum, for Plattner's blowpipe.

10750. **CONES**, Platinum Filter, seamless, 60°, profusely perforated with holes .016 to .025 inch.

Diameter, inches	3/4	1	1 1/2
Approximate weight, grams	1	2.1	5.3

10756. **CRUCIBLES**, Platinum, with cover. Crucible and cover weigh approximately as many grams as they hold cubic centimeters. Covers are always furnished unless specified otherwise.

Capacity, cc	10	15	20	25	30
Diameter and depth, mm	25	30	33	35	40
Approximate weight, grams	10	15	20	25	30

CRUCIBLES, Platinum, with capsule cover, for analysis of volatile matter in coal. Prices on request.

10772. **DISHES**, Platinum, evaporating, round bottom, with lip.

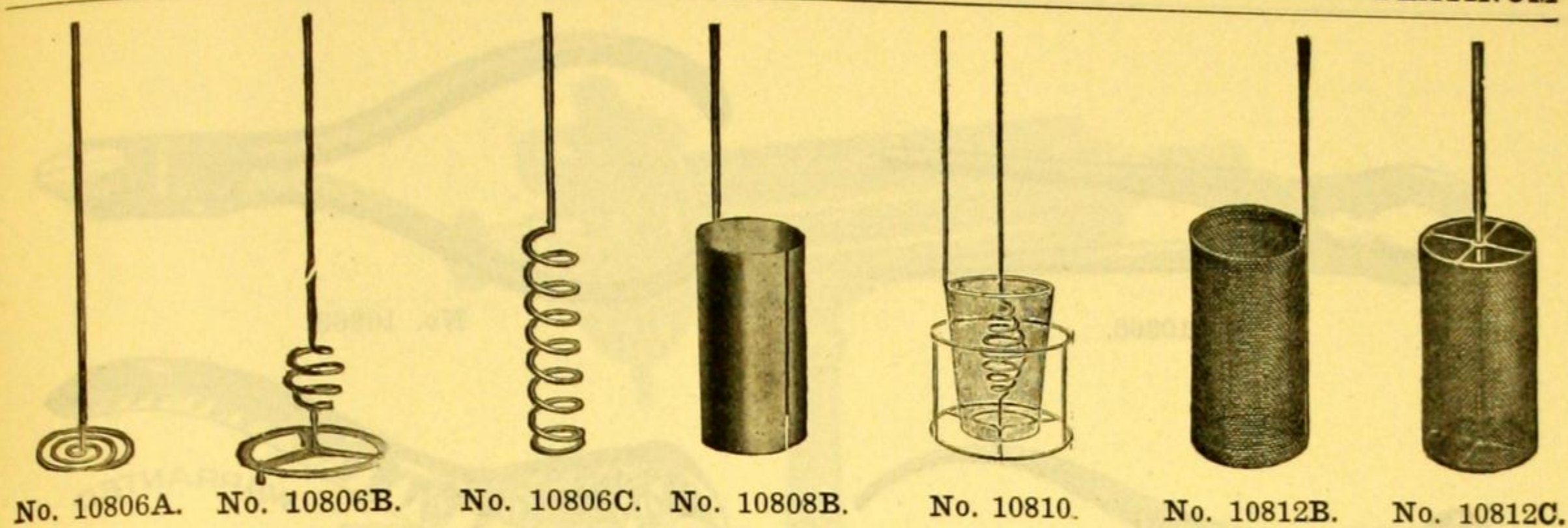
Capacity, cc	25	35	50	75	100	125	150	200
Diameter, mm	44	48	56	65	72	78	84	94
Approximate weight, grams	8	12	17	25	33	42	50	67

10784. **DISH**, Platinum, Payne's, for fertilizer analysis, flat bottom with lip, wire rimmed. Capacity, 100 cc; approximate weight, 40 grams.

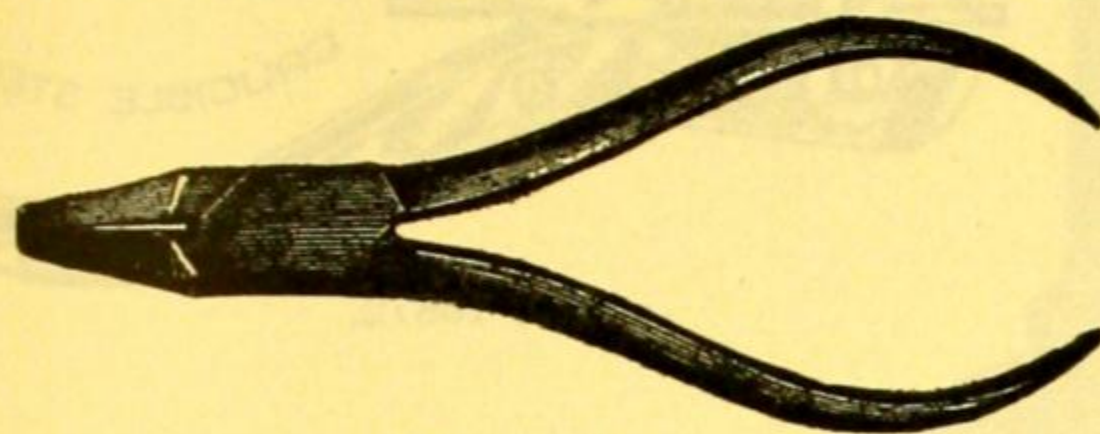
10788. **DISH**, Platinum, Sugar Analysis, lipped, with flat bottom and straight sides. Capacity, 35 cc; approximate weight, 16 grams.

10798. **DISH**, Platinum, Water Analysis, round bottom, shallow form, without lip. Capacity, 100 cc. Approximate weight, 20 grams.

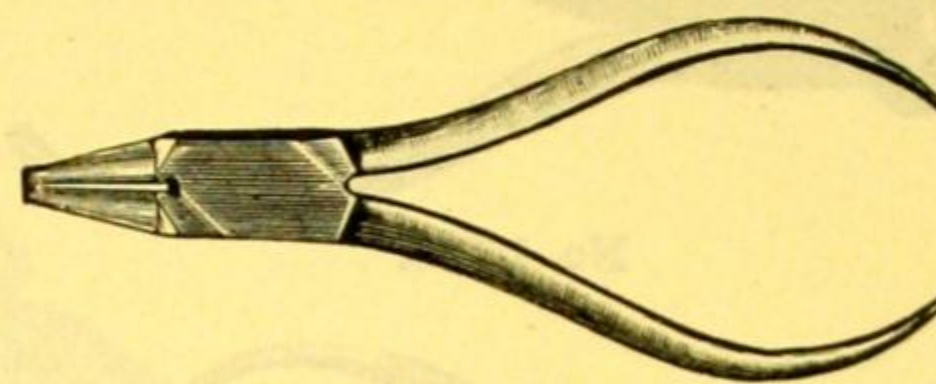
10800. **DISH**, Platinum, Water or Iron and Steel Analysis, shallow form with lip. Capacity, 45 cc; approximate weight, 15 grams.



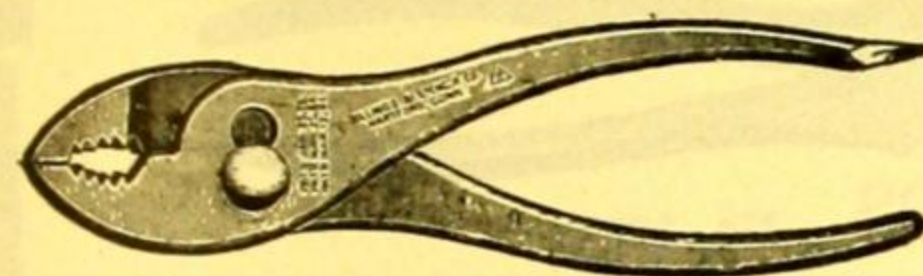
No. 10806A. No. 10806B. No. 10806C. No. 10808B. No. 10810. No. 10812B. No. 10812C.



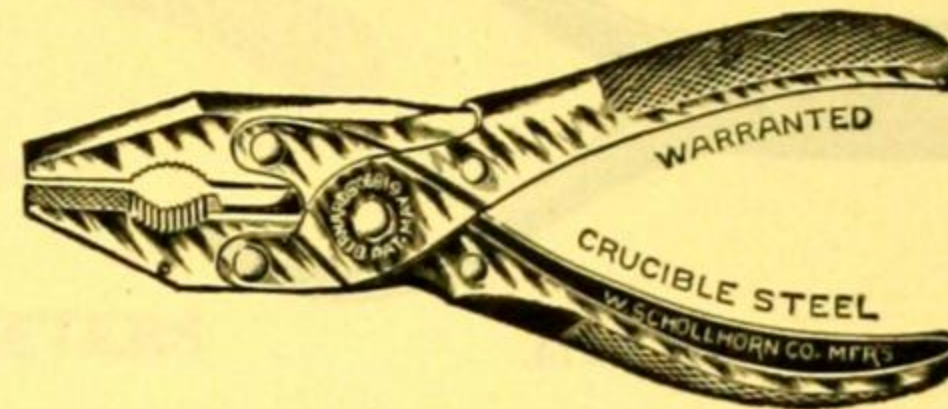
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No. 10858.



No. 10862.

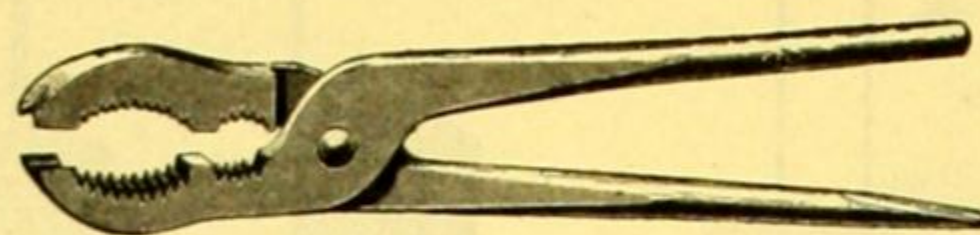


No. 10864.

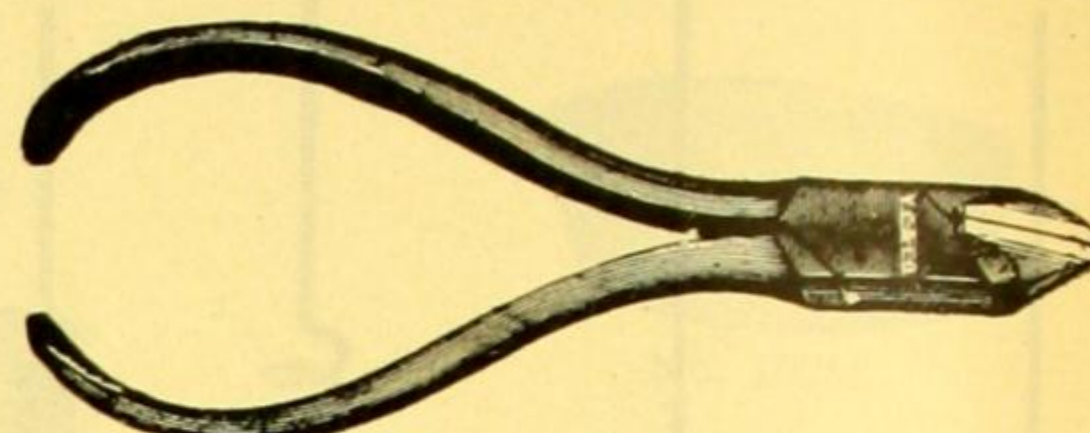
10806. **ELECTRODES, Platinum Anodes**, for electro-analytical work, made of heavy wire.
- | No. | A | B | C |
|---------------------------|-----|-----|-----|
| Length, mm | 150 | 150 | 125 |
| Diameter of spiral, mm | 38 | 50 | 15 |
| Approximate weight, grams | 8-9 | 20 | 7 |
10808. **ELECTRODE, Platinum Cathode**, for electro-analytical work, made of platinum sheet.
- | No. | B |
|---------------------------|----|
| Diameter, mm | 25 |
| Length of electrode, mm | 50 |
| Approximate weight, grams | 11 |
10810. **ELECTRODE, Platinum Gauze Cathode, Hollard's**, with special wire frame anode, designed to prevent formation of bubbles. Approximate weight, 52 grams. Diameter of anode, 2 inches.
10812. **ELECTRODES, Platinum Gauze**, cylindrical form, of 52-mesh gauze. Diameter, 25 mm; height of cylinder, 50 mm.
- | No. | B | C |
|---------------------------|--------|----------|
| Form | closed | rotating |
| Approximate weight, grams | 6 | 23 |
10818. **FOIL, Platinum.**
- | Style | light | medium | heavy |
|-----------------------------------|-------|--------|-------|
| Thickness, inches | .001 | .002 | .004 |
| Approximate grams per square inch | 0.352 | 0.703 | 1.405 |
- (Other thicknesses from tissue to plates can be supplied upon short notice.)
- FORCEPS**, with Platinum Tips, see **Forceps**.
- SAND, Sea**, for cleaning platinum ware, see No. 12010.
- TONGS** with Platinum Tips, see **Tongs**, Crucible.
- WEIGHTS**, Platinum, see general heading **Balances and Weights**.
10846. **WIRE, Platinum.**
- | B. & S. gage | 18 | 20 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 32 | 34 | 36 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Approx. grams per ft. | 5.37 | 3.41 | 2.08 | 1.76 | 1.33 | 1.08 | 0.85 | 0.65 | 0.56 | 0.41 | 0.33 | 0.22 | 0.14 | 0.09 |
- HOLDER** for Platinum Wire, see No. 7990.

PLIERS

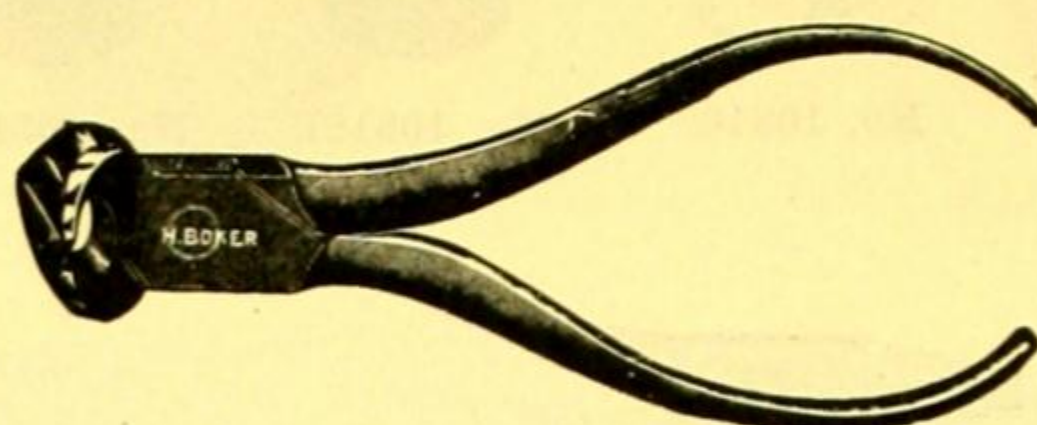
10856. **PLIERS**, flat nose. Length, 6 inches. \$1.10
10858. **PLIERS**, round nose. Length, 6 inches. 1.10
10862. **PLIERS, Combination.** Gas plier, wire cutter, wrench and screw driver combined. Drop forged from high grade tool steel and warranted free from defects. A very useful tool.
- | Length, inches | 6 | 10 |
|----------------|-----|------|
| Each | .50 | 1.00 |
10864. **PLIERS, Combination.** A flat nose gas plier and wire cutter combined. Open throat, parallel jaws, full nickel-plated. Length, 5½ inches. 1.95



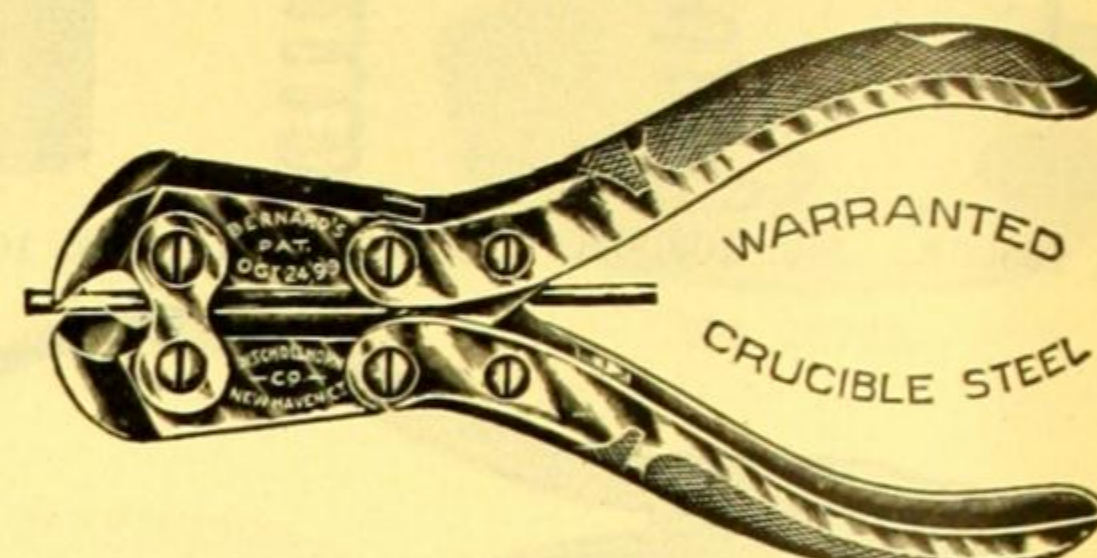
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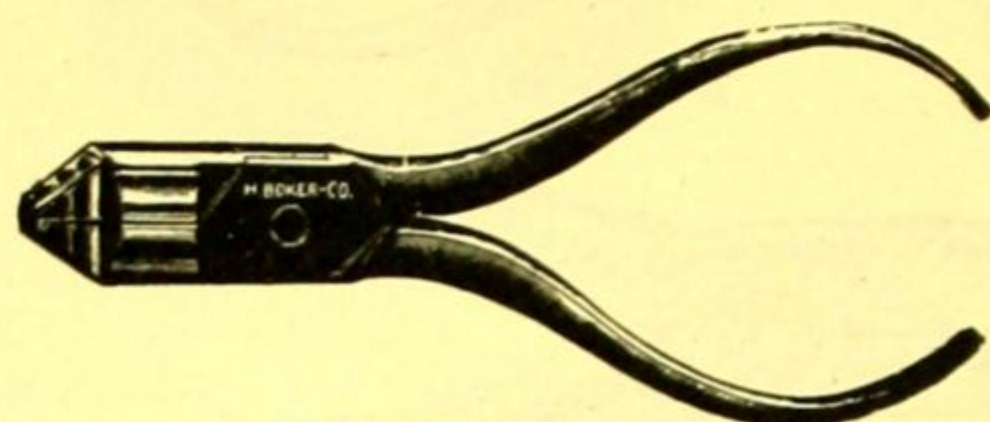
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No. 10870.



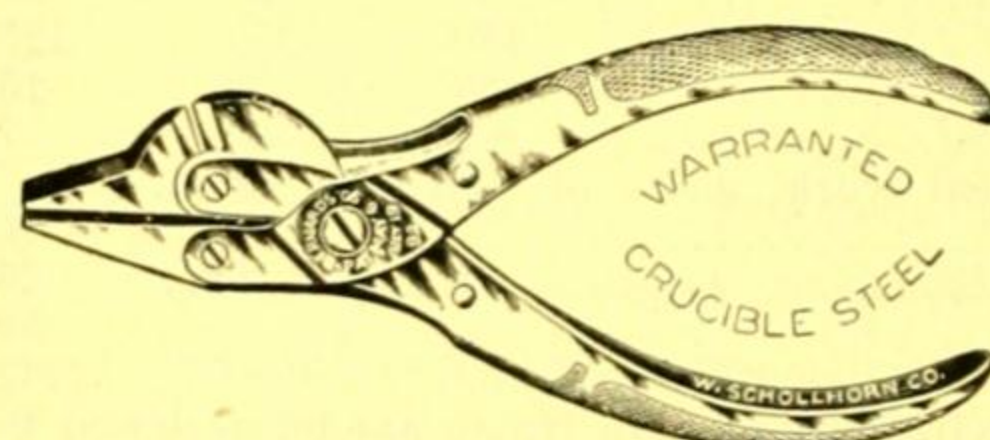
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No. 10874.



No. 10878.



No. 10876.

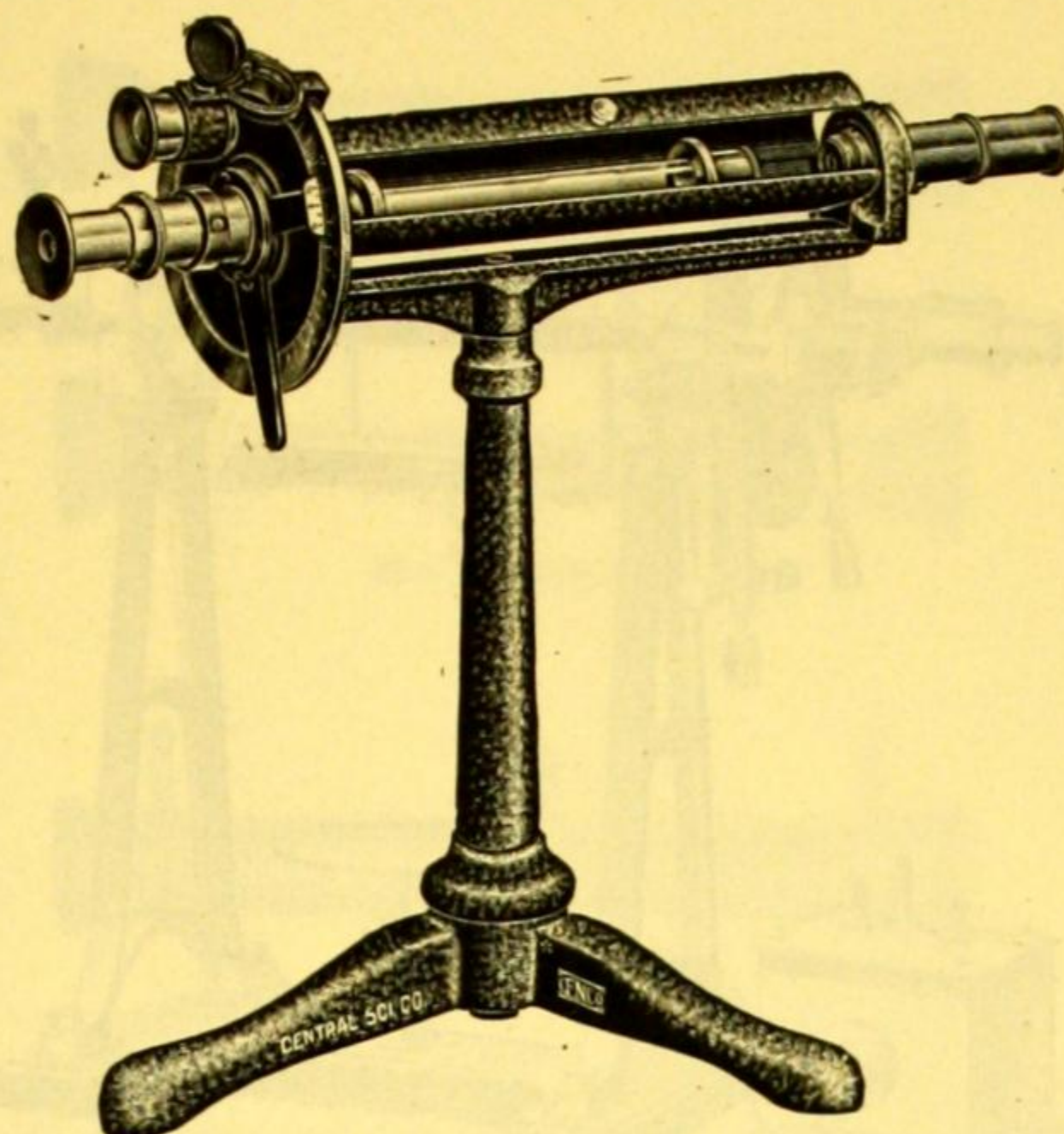


No. 10884.



No. 10886.

10866. **PLIERS**, Gas, cast steel, fine quality. Length, 9 inches..... \$0.50
10868. **PLIERS**, Nippers, Diagonal Cutting, convenient for cutting in places difficult of access. Length, 5 inches..... 1.70
10870. **PLIERS**, Nippers, End Cutting, 6-inch..... 1.20
10872. **PLIERS**, Nippers, End Cutting, Bernard's, 6-inch, open throat jaws, nickel-plated, interchangeable parts. Its compound system of leverage makes this tool a very powerful cutter.. 3.50
10874. **PLIERS**, Wire Cutting. Flat nose, side cutting pliers. Length, 5 inches..... .80
10876. **PLIERS**, Wire Cutting, Bernard's. Open throat, parallel jaws, nickel-plated. Length, 5½ inches..... 2.50
10878. **PLIERS**, Wire Cutting, Button's patent. Length, 6 inches..... .80
10884. **PLUMB BOB**, Iron, japanned, weight, 9 ounces20
10886. **PLUMB BOB**, Mercury. Made from solid steel rod, bored out and filled with mercury, which makes it unusually heavy in proportion to its size, and the center of gravity low. The small diameter allows it to be used close to corners and walls. The point is hardened and the body and point ground. Nickel-plated and furnished with a braided silk line. Size, 4x½ inches; weight, 2½ ounces..... 1.80
- PNEUMATIC TROUGHS**, see Troughs, Pneumatic.



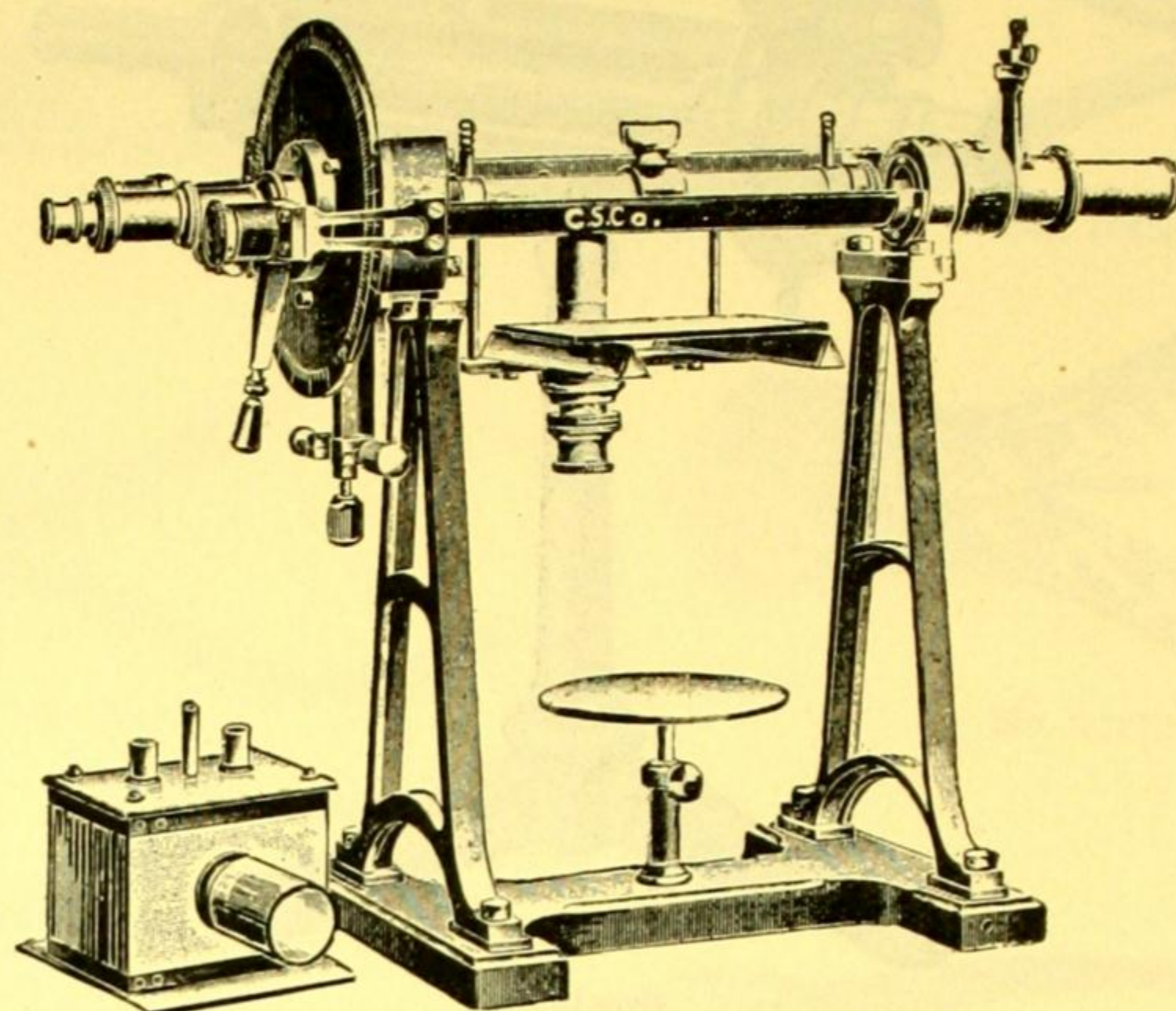
No. 10887.

POLARIMETERS

It has been the practice of dealers in scientific instruments to list all polariscopes under the heading of polarimeters and saccharimeters. But, as polarimeters are the universal instruments, adapted for all kinds of scientific investigation on optically active substances, and saccharimeters are for only a specific class of work, we list saccharimeters for sucrose or cane sugar under the heading of **SACCHARIMETERS** (see Nos. 11680 and 11688). Saccharimeters for glucose or grape sugar will be found under **URINE ANALYSIS APPARATUS** (see No. 14090).

We offer two types of polarimeters; the Laurent, having a quartz plate in the optical system to produce the half-shadow, and the Lippich, having a third Nicol prism for this purpose. The Laurent is the usual form for investigations with monochromatic light from a sodium flame, the principle spectrum line of which has a wave length of 589.3 μ . Where the optical rotation of substances is to be investigated with light of other wave lengths the Lippich type must be used. All polariscopes, in which the optical rotation is compensated by the rotation of the Nicol analyzer prism, must be used with monochromatic light.

10887. **POLARIMETER, Half-Shadow, with Laurent Polarizer**, a general laboratory instrument of suitable accuracy and simplicity to adapt it to the requirements of student work in physical chemistry and for the determination of glucose in urine in the medical laboratory. This instrument is equipped with the Laurent type of polarizer, having a quartz plate in the optical system to produce the divided field. The Laurent type is the usual form for investigations with monochromatic light from a sodium flame. The optical rotation of the material under observation is compensated by rotating the Nicol analyzing prism by means of a lever. The half-shadow field is observed through an easily focused telescope. Readings are made in angular degrees to 0.1 degree of arc from the silvered scale graduated about the circumference of the circle, 12 mm in diameter, by means of two verniers, mounted diametrically opposite each other. A small mirror and a magnifying lens are conveniently mounted in front of the graduated dial in such a manner that they can be used to illuminate and magnify the vernier scales when in any position. The trough for the observation tubes will accommodate tubes up to 200 mm long. When observation tubes of 189.4 mm are used, the graduated scale becomes direct reading in per cent. of glucose or grape sugar. With a 94.7 mm tube, glucose determinations can be made to .05 per cent. The trough is provided with a hinged cover to exclude outside light. The instrument is mounted on a solid stand with a heavy tripod base. **Without observation tubes or sodium burner**..... \$70.00

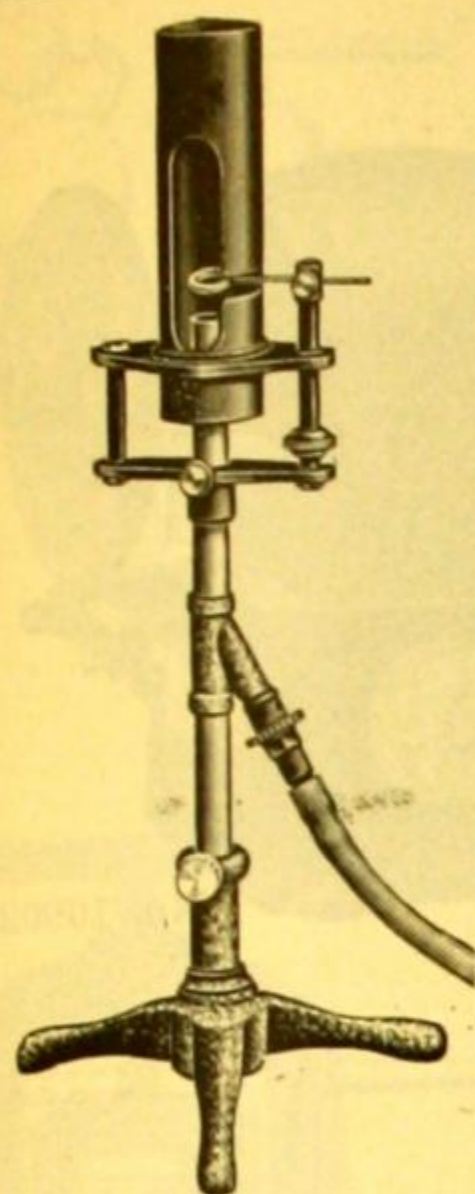


No. 10888A.

No. 10888.

10888. **POLARIMETER, Schmidt and Haensch, Half-Shadow with Lippich Polarizer.** An exceptionally fine instrument suitable for the most refined work on the optical rotation of substances. The Lippich polarizer consists of two Nicol prisms so mounted as to produce the divided half-shadow field. By this arrangement measurements can be made on the optical rotation of any particular wave length of light. An adjustment is provided for changing the angle of the two prisms in order to increase the sensitivity of the instrument. Immediately in front of the polarizer, a filter cell is placed for absorbing light of other wave lengths than that under investigation. The support is of the trestle design, consisting of a heavy base plate to which the two heavy, well-braced legs are securely fastened. This construction provides ample space between the polarizer and analyzer for the use of electromagnets, heating or cooling devices, etc., as may be required in the course of a research problem and yet insures the constant alignment of the optical system. A trough is provided for the usual observation tubes up to 220 mm in length. An adjustable object support is suspended from an iron cross-piece. It consists of two triangular rails upon which a brass plate, provided with grooves on the under side, rests. Horizontal adjustments of the objects resting on it are made by sliding the plate on the rails. Vertical movement is obtained by turning a knurled screw-head which moves both the rails and plate. Under the object support an adjustable table for burners, etc., is provided. The readings of angular rotation are made from a silvered disk, 175 mm in diameter, having a scale graduated around its outer edge through 360° by 0.25° divisions. Two diametrically opposite verniers with magnifiers and illuminating mirrors enable readings to be made to 0.01° . The entire graduated disk is enclosed in a metal case with windows for reading the scale, to prevent corrosion of the fine divisions by the fumes of the laboratory. **Without sodium burner or observation tubes** \$550.00

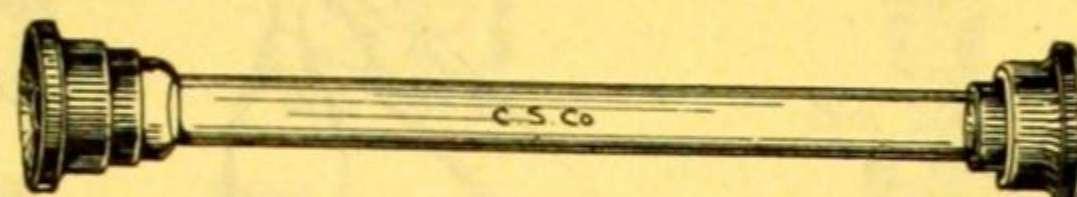
- 10888A. **Heating Apparatus,** for investigating the optical rotation of substances at various temperatures. Consists of a brass compartment covered with asbestos through which a brass observation tube, plated with gold inside, passes. The observation tube is 100 mm long. The optical glass covers are held in place by screw caps which are provided with projecting glass tubes to prevent moisture from the burning gas used to heat the device from condensing on the surface of the covers. With thermometer graduated to 100° Centigrade..... 50.00



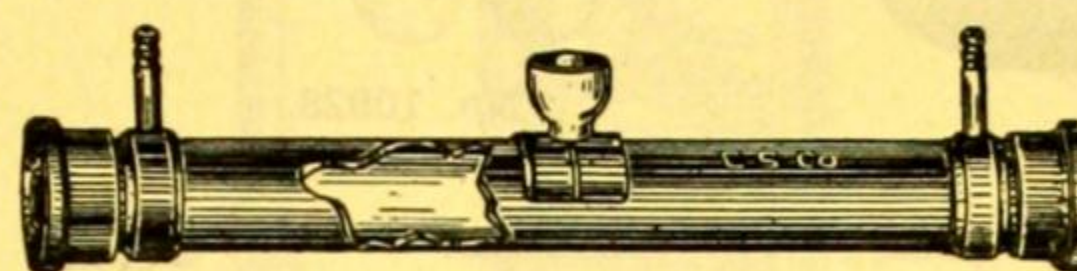
No. 10888B.



No. 10889A-E.



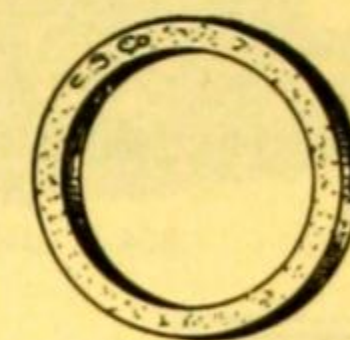
No. 10889K-M.



No. 10890A-C.



No. 10891A-B.



No. 10891F-G.

10888B. **Sodium Burner, Gas**, for use with polarimeters Nos. 10887 and 10888. Consists of a gas burner with adjustments for both gas and air, mounted on a stable tripod stand. Both the burner and the metal shield with which it is surrounded are fully adjustable for height. The pan for the fused sodium chloride is made of a nickel chromium alloy..... \$14.00

10889. **Observation Tubes, Glass**, with metallic screw cap ends and with optical glass covers. Tubes Nos. A and C, when used with polarimeter No. 10887, render that instrument direct reading in per cent. of glucose or grape sugar, enabling it to be used for urine analysis.

No.	A	B	C	D	E
Length, mm	94.7	100	189.4	200	400
Each	5.00	5.00	5.00	5.00	5.50

10889. **Observation Tubes, Glass with enlarged end**. Same as No. 10889A-E, but with one end enlarged to remove air bubbles from the line of measurement.

No.	K	L	M
Length, mm	100	200	400
Each	6.00	6.00	7.00

10890. **Observation Tubes, Inversion Type**. Consists of a glass observation tube with a tubulation for the insertion of a thermometer. The entire glass tube is surrounded by a brass water jacket with connections conveniently arranged for circulating a constant temperature stream of water to maintain the contents of the glass tube at the proper temperature. **Without thermometer.**

No.	A	B	C
Length, mm	100	200	400
Each	8.00	8.00	10.00

10890F. **Thermometer**, for use with observation tubes No. 10890.

Graduated from 10° to 32° C. by 0.1°..... 2.75

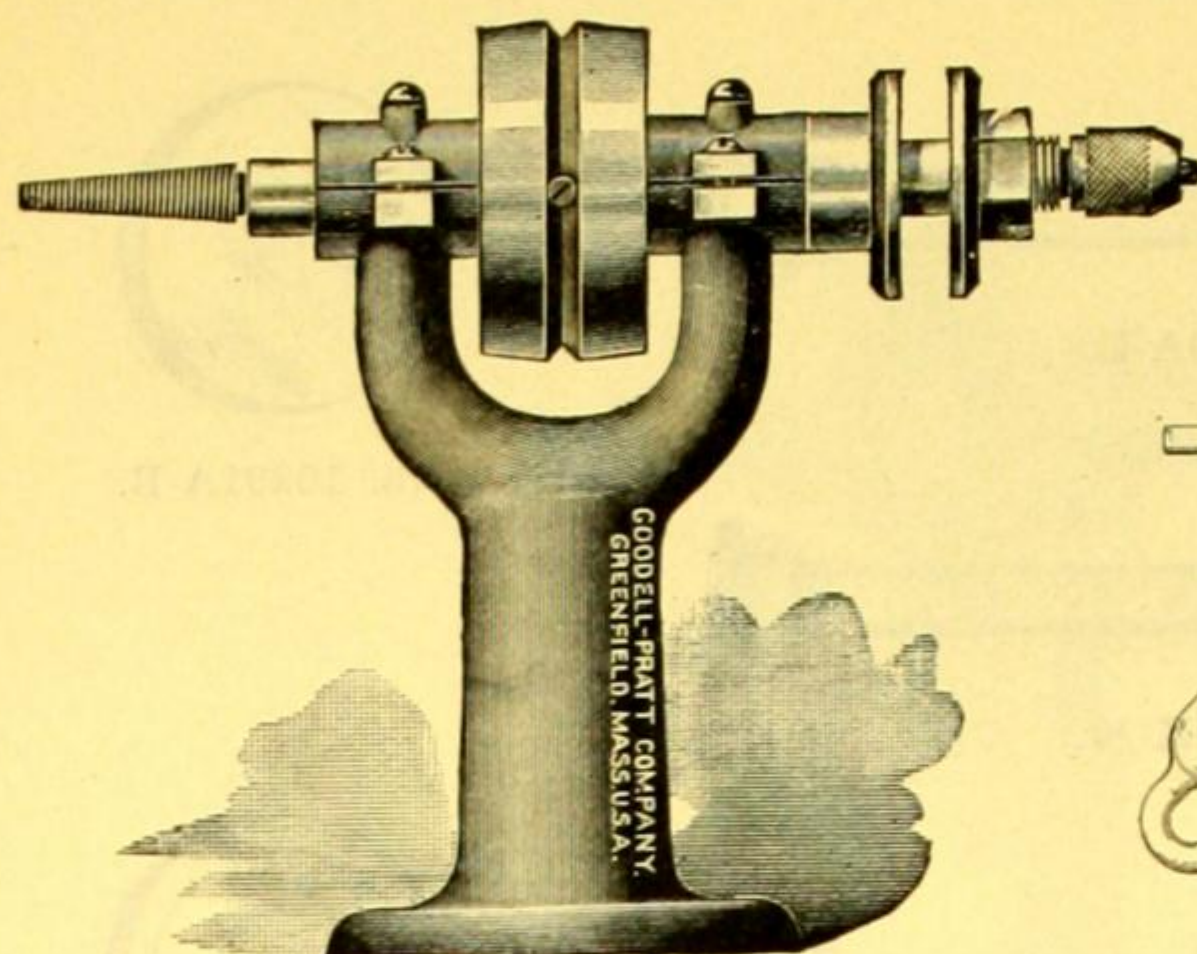
10891. **Cover Glasses**, for observation tubes, with surfaces plane and parallel. Made of optically inactive glass.

No.	A	B
Diameter, mm	15.5	23.7
Per dozen	3.00	4.00

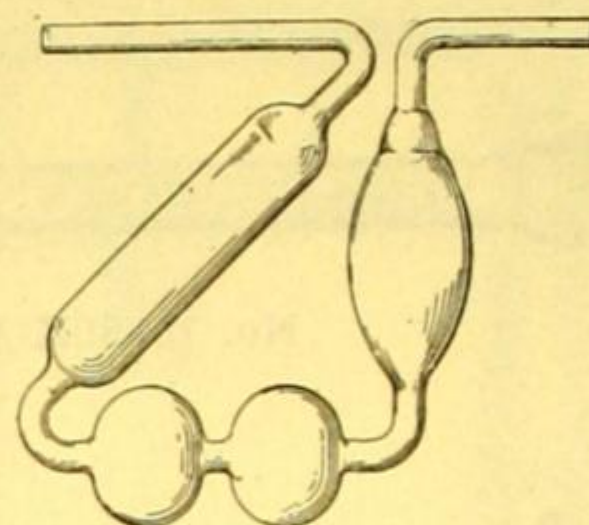
10891. **Rubber Rings**, for use between the screw cap and cover glass of the observation tube.

No.	F	G
Diameter, mm	15.5	23.7
Per dozen	.40	.40

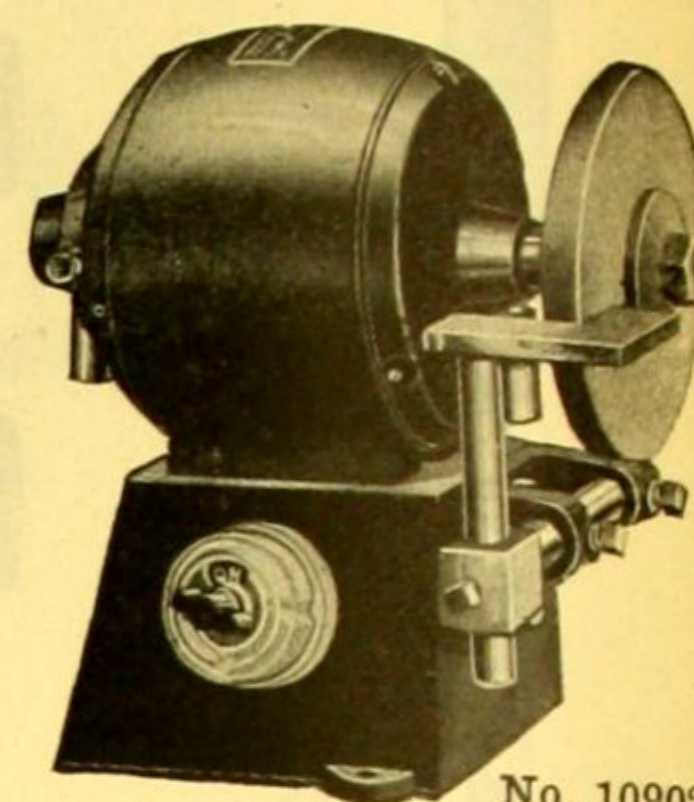
For Water Heating and Circulating Devices, see page 431.



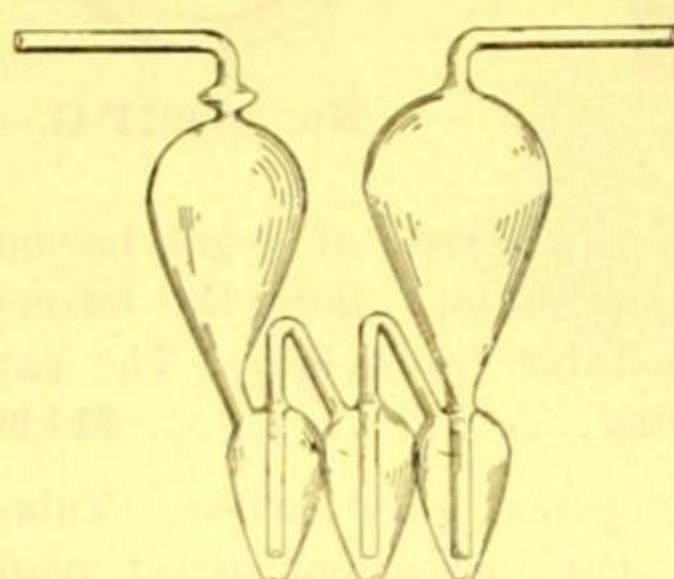
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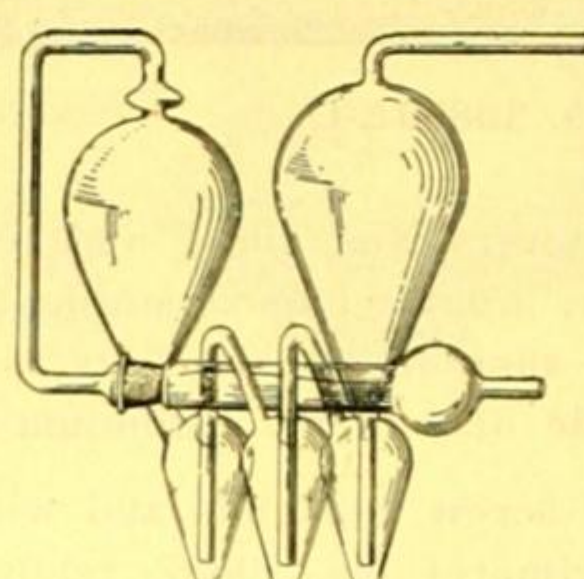
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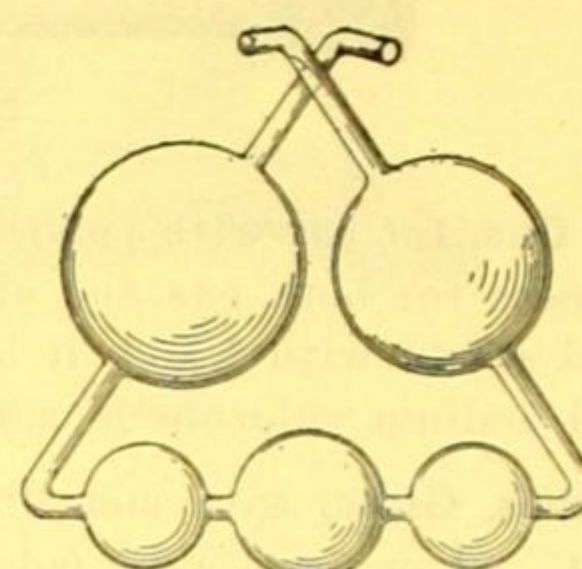
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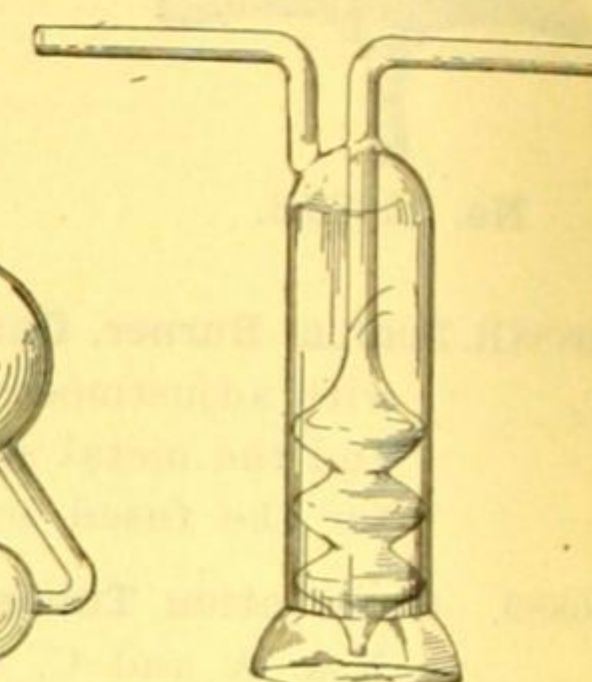
No. 10916.



No. 10918.



No. 10922.



No. 10914A.

POLISHING HEADS

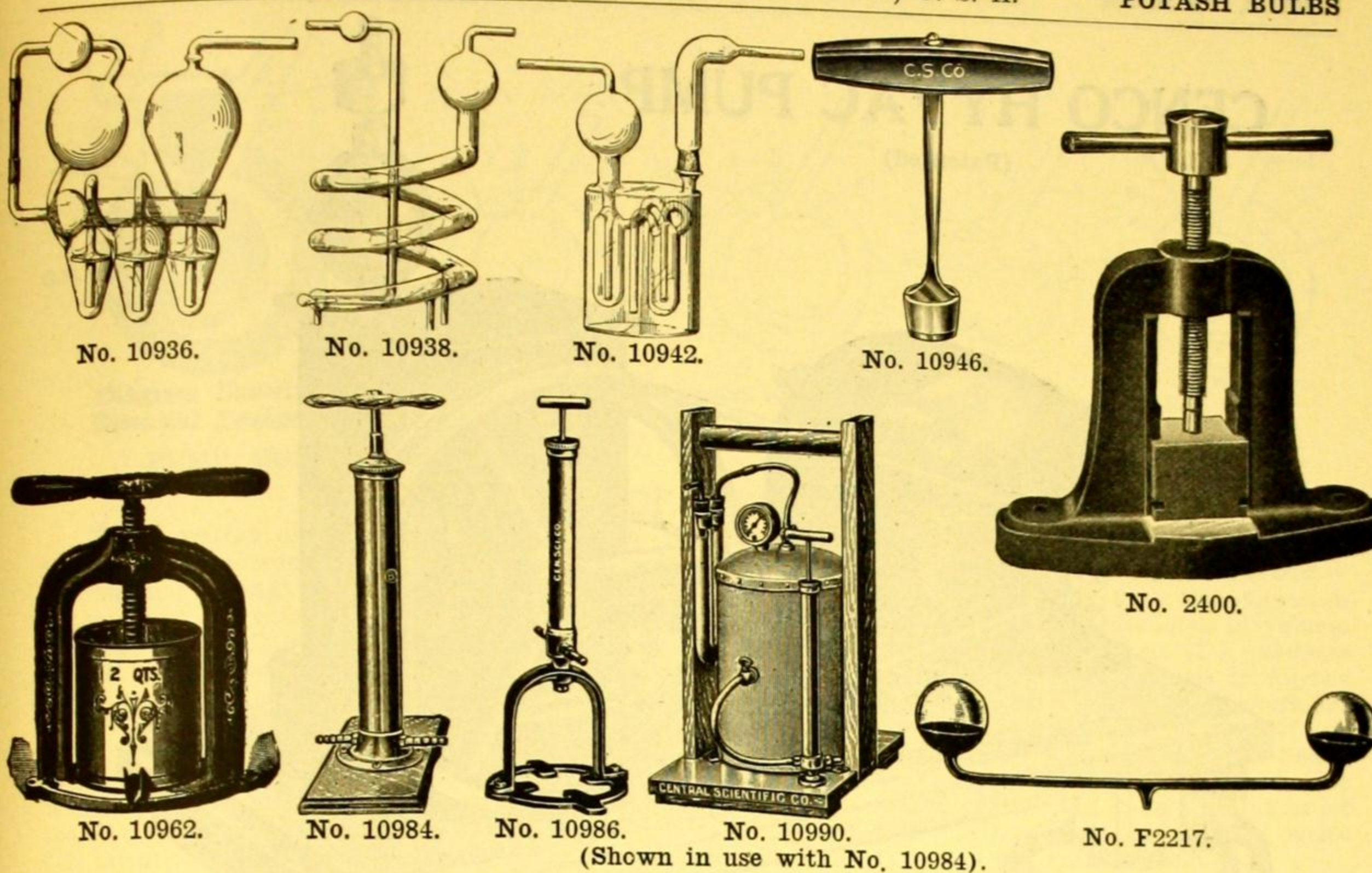
10894. **POLISHING HEAD.** Japanned iron frame; steel spindle $\frac{1}{2}$ -inch in diameter and 10 inches long; adjustable boxes. Carefully threaded taper screw on one end and three-jawed chuck for 0 to $\frac{1}{4}$ -inch drills on the other. Fitted to hold emery wheels, circular saws, buffers, etc., which have $\frac{1}{2}$ -inch hole and are not over $\frac{3}{4}$ -inch in thickness. Height, 7 inches. Pulley will take $\frac{3}{2}$ -inch round or $\frac{3}{4}$ -inch flat belt. Net weight, $4\frac{1}{4}$ lbs. \$4.40

ACCESSORIES FOR NO. 10894 POLISHING HEAD.

- 10895B. **Circular Saw**, good quality steel, $2\frac{1}{2}$ inches in diameter. With $\frac{1}{2}$ inch hole.50
 10896B. **Emery Wheel**, fine quality, 3 inches in diameter, $\frac{1}{2}$ -inch thick. With $\frac{1}{2}$ -inch hole.80
 10897. **Felt Polishing Wheel**, fine quality felt, 5 inches in diameter, 1-inch wide, $\frac{1}{8}$ -inch hole. Fits screw end of No. 10894 Polishing Head. 3.75
 10898B. **Muslin Buff Wheel**, 35 pieces heavy muslin, strongly attached together; 3 inches in diameter. With $\frac{1}{2}$ -inch hole.40
 10902. **POLISHING HEADS, Electric**, for either A. C. or D. C. Will meet all requirements for light grinding, buffing, etc. Motor enclosed, protecting all working parts from flying dust and dirt. Bearings are made of extra heavy phosphor bronze. Steel shaft $\frac{1}{2}$ -inch in diameter. Lubrication is automatic by means of feed wick oil cups. Motor practically noiseless in operation. Has a speed of 3,000 r. p. m. and will develop $\frac{1}{6}$ h. p. Dimensions: height over all, $9\frac{1}{2}$ inches; base, 6x5 inches; length of shaft, $9\frac{1}{2}$ inches. Finished in black japan. Buffing attachment to hold small buffs for buffing wheel may be had. (See No. 10905.) Has emery wheel 5 inches in diameter, $\frac{1}{2}$ -inch face, adjustable tool rest as illustrated, indicating snap switch, attachment plug and six feet reinforced cord.
 No.
 For volts A C
 Each 110 A. C. 110 D. C.
 10905. **Buffing Attachment**, for the above Electric Polishing Heads. 57.50 41.50
PORCELAIN WARE, see specific headings, Capsules, Crucibles, Dishes, Mortars, etc. 3.10

POTASH BULBS

- 10914A. **POTASH BULB**, Bowen. 2.50
 10916. **POTASH BULB**, Geissler. 1.40
 10918. **POTASH BULB**, Geissler, with drying tube ground on. 1.70
 3132. **POTASH BULB**, Johnson, as used in Combustion Apparatus No. 3120. 1.80
 10922. **POTASH BULB**, Liebig, with five bulbs.90
 10928. **POTASH BULB**, Norris, as used in determining sulphur in iron and steel.70
POTASH BULB, Vanier, see Absorption Tubes.



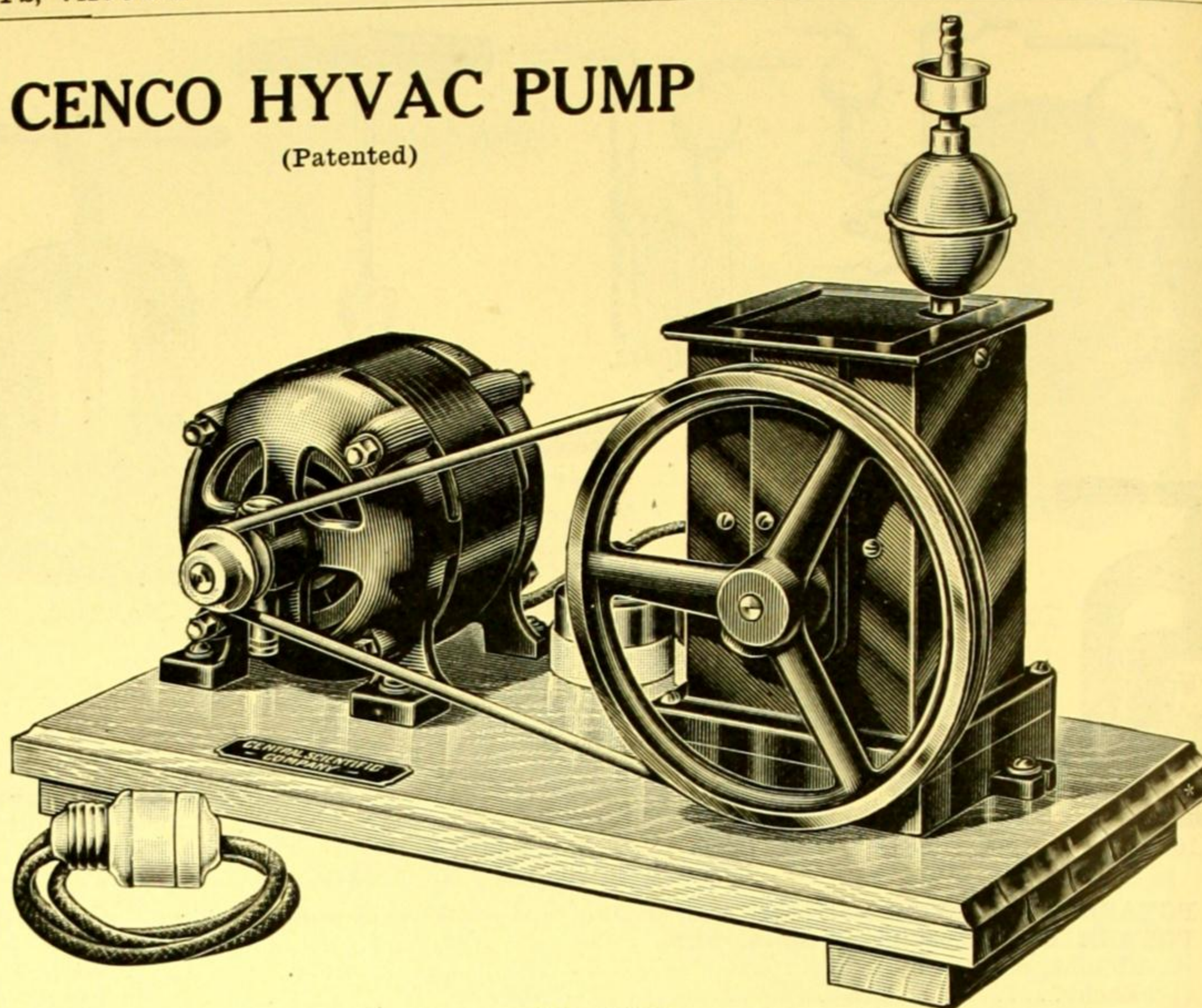
10936. **POTASH BULB**, Wetzel-Geissler, with drying tube attached by rubber tubing..... \$2.00
10938. **POTASH BULBS**, Winkler, spiral form. No. A B
 Height, mm 100 180
 Each 1.50 2.50
10942. **POTASH BULB**, Zahradink, with drying tube ground on. Convenient to use as it stands easily on its own base..... 3.00
- For other **POTASH BULBS**, see **Absorption Bulbs and Tubes**.
- POTASH BULB SUPPORTS**, see **Supports**.
10946. **POTATO CUTTER**, Ravenel, for cutting potato cylinders 18 mm in diameter and halving them at the same time..... 3.00
- PRECIPITATING JARS**, see **Jars**.
- PRESS**, Filter, see **Filter Press**.
2400. **PRESS**, Pellet, for use in calorimetric determinations for briquetting powdered fuels... 24.00
10962. **PRESSES**, Tincture, extra heavy, for making tinctures, extracts, etc.
 Capacity, quarts 2 4 8
 Each 10.00 13.50 18.00
- PRISMS**, see **Catalog F of Physical Apparatus**.
- PROJECTION APPARATUS**, see **Catalog F of Physical Apparatus**.
- PROOFING CABINETS**, see **Floor Testing Apparatus**.
- PSYCHROMETERS**, see **Hygrometers**.
- F2217. **PULSE or PALM GLASS**, Franklin's. Two glass bulbs with connecting tube, containing water and water vapor. When one bulb is held in the hand, the warmth of the hand is sufficient to cause rapid evaporation of the water, thus causing sufficient pressure to force the liquid into the other bulb, where a rapid boiling occurs. About 18 cm long..... .70
- PUMPS**, Acid, see **Acid Pumps**.
- PUMPS**, Air, Blowers, see general heading **Blowers**.
- PUMPS**, Air, Filter, see **Filter Pumps**.

AIR PUMPS, COMPRESSION AND VACUUM

10984. **PUMP, AIR, Vacuum and Pressure**. Cylinder is of heavy brass, nickel-plated, 40 cm long by 54 mm in diameter. A vacuum to 29½ in. may be obtained by use of this pump. Mounted on an oak base..... 15.00
10986. **PUMP, AIR, Vacuum and Pressure**. Useful in elementary work in the laboratory and where only a partial vacuum is desired. Cylinder is of brass, 28 cm long by 2.5 cm in diameter. Mounted on stirrup for ease in using..... 5.25
10987. **Extra Valve for No. 10986 Air Pump**..... .05
- For **PUMP PLATES**, see page 420.
10990. **AIR TANK**, for use especially with Nos. 10984 or 10986 Air Pumps. A 12 liter air tank with a 30 lb. pressure gage mounted on a nicely finished hardwood base. For convenience in moving from place to place the support is provided with a handle and an air drying tube is mounted on one of the uprights as shown in the illustration. This apparatus may be used where air under pressure is needed, e. g., for driving stirrers in chemical laboratories. With stop-cock at both air inlet and air outlet and with rubber tube for connection with Nos. 10984 or 10986 24.00

CENCO HYVAC PUMP

(Patented)



No. 10999.

The Cenco Hyvac Pump is a new application of and an improvement upon a very old mechanical principle in pump construction; that of a solid cylinder mounted upon a shaft, so as to rotate eccentrically within a larger hollow cylinder.

With the usual applications of this principle it has been found difficult to produce a vacuum of the order of one bar (0.00076 mm) without the use of a preliminary pump. Other difficulties of a mechanical nature are encountered when attempts are made to increase the effectiveness of pumps made according to the usual design. These limitations which are inherent in the usual application of this principle, led our manufacturing department to begin an extended series of experiments to determine whether by certain changes it would be possible to produce a **self-contained high-vacuum pump**, which would produce by itself, **without any preliminary or backing pump**, a vacuum of 0.001 mm or more. Other requirements which were established were compactness, small size, ease of operation, small power required, freedom from heating, freedom from spattering of oil and maintenance of efficiency throughout a long period of continuous operation.

FEATURES OF DESIGN.

The Cenco Hyvac Pump is the outcome of these experiments and has more than justified the hope of its designers. The wide departure from previous designs is clearly indicated in the diagram on the following page. The following new features will be readily noted:

1. The position of the movable vane (C) in the wall of the outside cylinder instead of in the rotor.
2. The entire separation of the inlet (E) and outlet (F) ports at all times, by the sealing of the rotor at two points (K) and (G), thus overcoming any possibility of leakage.
3. The location of the inlet and outlet ports at the very edges of the vane, which insures the removal of the last vestige of air before the inlet port is uncovered and prevents any diffusion of air back into the vessel being exhausted.
4. The use of two sets of parts, constituting a two-stage pump, one of which acts as a backing or fore-pump, the other a finishing pump. This makes the outfit entirely self-contained.
5. The entire immersion of the pump in an oil carefully selected after exhaustive tests as the best for this purpose. This effectually seals every surface and prevents any leakage from without. It serves further to distribute any heat generated by the friction of the rotor against the vane and thereby prevents displacement of the parts through expansion.
6. A low speed of rotation is made possible by the absence of leakage, which renders unnecessary any water jacket or cooling device, since the temperature of the oil rarely rises above 40°C.
7. The valve at the outlet (L), which cuts off the back pressure of the atmosphere against the rotor and thereby reduces to a minimum the power required to operate the pump.
8. The automatic trap at the inlet, which effectually prevents the "sucking back" of any oil into the exhausted vessel, should the pump be stopped for any reason.

(Continued on next page.)

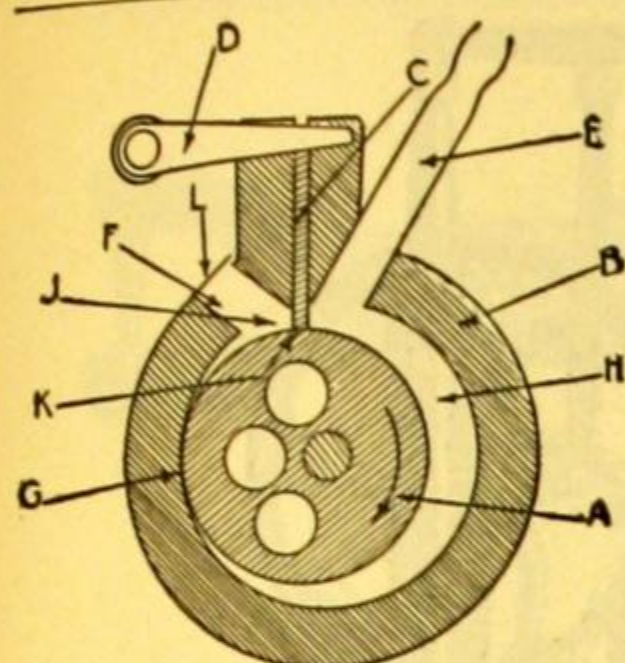
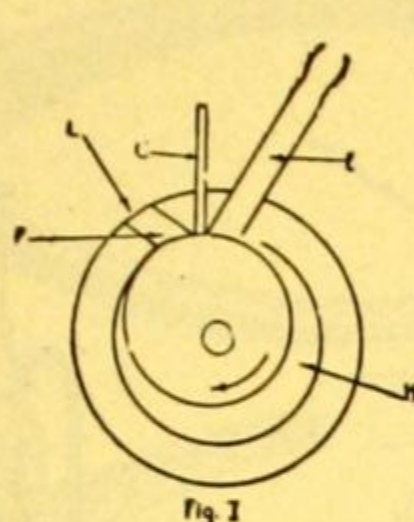
Diagram Showing
Essential Features.

fig I

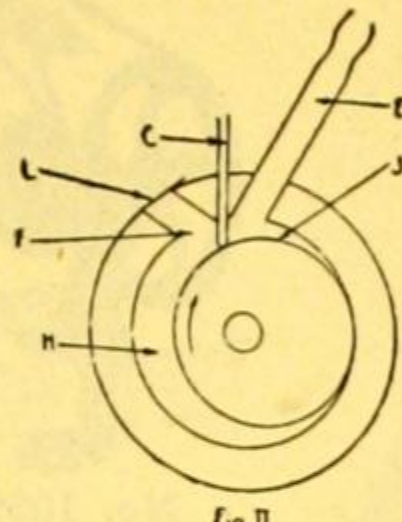


fig II

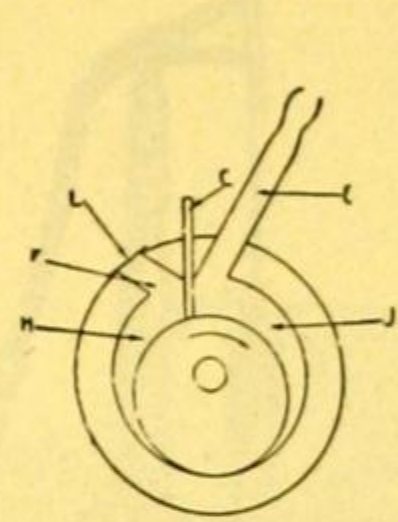


fig III

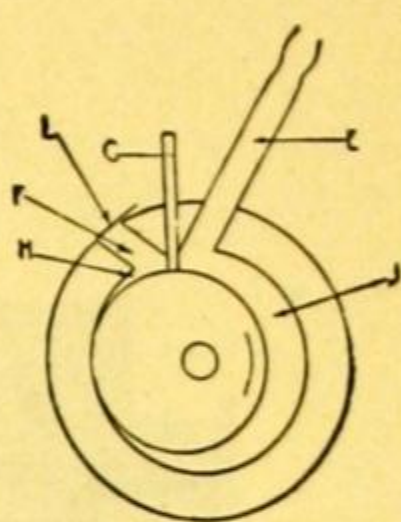


fig IV

Diagram Showing Stages of Operation.

PUMP, Cenco Hyvac—Continued.

CYCLE OF OPERATION

The operation of the pump is easily understood from an examination of the four sectional diagrams which represent one complete cycle. When the rotor is in position I, the vessel to be exhausted is connected through the open inlet tube (E) to the space (H), which becomes filled by the expansion of the air in the vessel. When position II is reached, the space (H) has begun to diminish in volume since the vane (C) which is held tightly against the rotor by spring pressure on the arm (D), prevents the air from following the rotor around. Additional air from the exhausted vessel expands to fill the empty space (J) left between the vane and the rotor, which increases in volume as the rotor continues toward position III. In position III, space (H) has become contracted about one-half, so that if the air were unable to escape, it would be in a state of compression as compared with the air in the vessel, which would increase as the rotor moves toward position IV. Actually the air in space (H) can not escape until it reaches a pressure equivalent to the sum of the pressure of the atmosphere and that of the oil above the valve (L), since it must lift this valve against that combined pressure. When space (H) is entirely closed, the air has all been pushed into the outlet tube and the cycle is complete.

DETAILED DESCRIPTION

As shown in the phantom view, the Cenco Hyvac Pump consists of **two stages** as described above, mounted vertically at a slight angle to each other, with the rotors mounted on a common shaft. The stages are securely attached to one vertical side of a square cast iron case, with removable lid through which passes the inlet tube. The horizontal shaft passes through a **stuffing box** which can be tightened up as necessary to prevent leakage.

The shaft carries a 7-inch pulley, grooved for $\frac{5}{8}$ -inch round belt, which provides the proper speed of operation when connected to the usual fractional horsepower constant speed motor.

For the convenience of those who have motors available, the pump is listed unmounted, or mounted on a wooden base of the proper size. For those who wish a complete self-contained outfit, it is furnished mounted with the proper motor and belt on a single wooden base, 9 by 18 inches, complete with snap-switch and five-foot connecting cord with separable attachment plug for connection to any lamp socket. The base of the motor is slotted to provide for tightening the belt as needed.

The inlet tube ends in a **hose-end** for the convenient attachment of a heavy rubber vacuum tubing such as our No. 11610.

An **annular seal** is provided upon the inlet tube which enables the operator, by the use of de Khotinsky Cement or Wood's Metal, to attach a glass tube quickly and tightly to the pump and to remove it with equal ease.

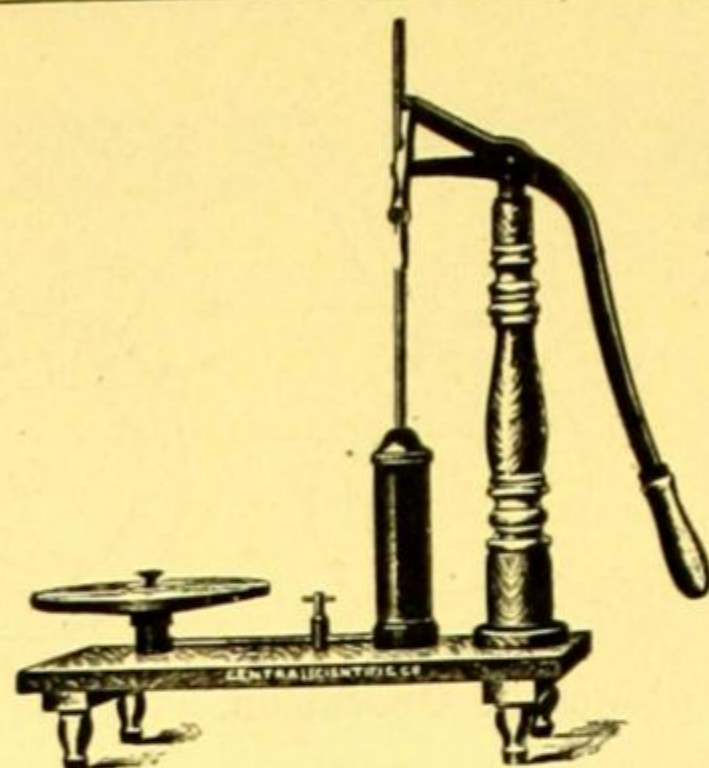
Phantom View Showing Arrange-
ment of Pump.

The mechanical arrangement of the pump is such as to **prevent the foaming or spattering of oil**, common to many oil sealed pumps.

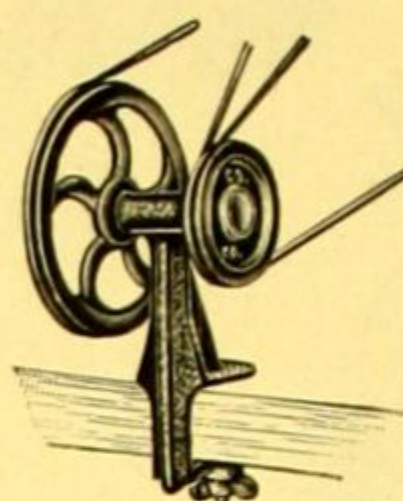
A further source of great annoyance to users of vacuum pumps is the "sucking back" of oil into the exhausted vessel when the pump is stopped without disconnecting the vessel. To prevent such a possibility, our engineering department has designed an **automatic trap** which operates effectively to cut off the back flow of oil into the connecting tube. When the pump is again started the cut-off is automatically released and the operation of evacuation is continued as though it had not been interrupted.

Complete as described above, with automatic trap, seven-inch pulley grooved for $\frac{5}{8}$ -inch round belt, and with supply of oil especially selected for high vacuum work.

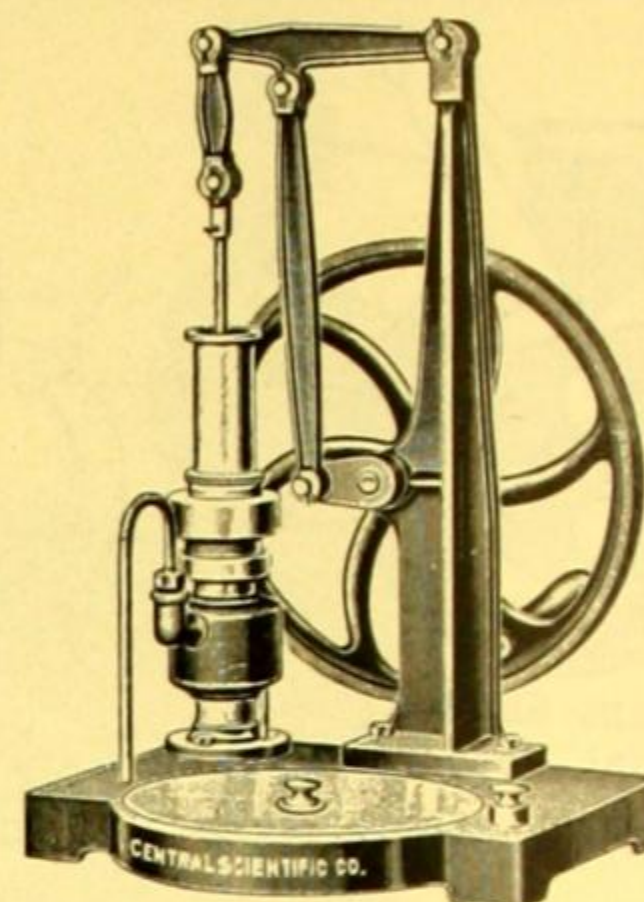
10996. PUMP, CENCO HYVAC, unmounted.....				\$50.00
10996A. PUMP, CENCO HYVAC, mounted on hardwood base with belt, without motor.....				57.50
10999. PUMP, CENCO HYVAC, mounted on hardwood base, with motor.....				
No.	A	B	C	D
	A. C.		D. C.	
For volts	110	220	110	220
Each	90.00	92.50	85.00	87.50



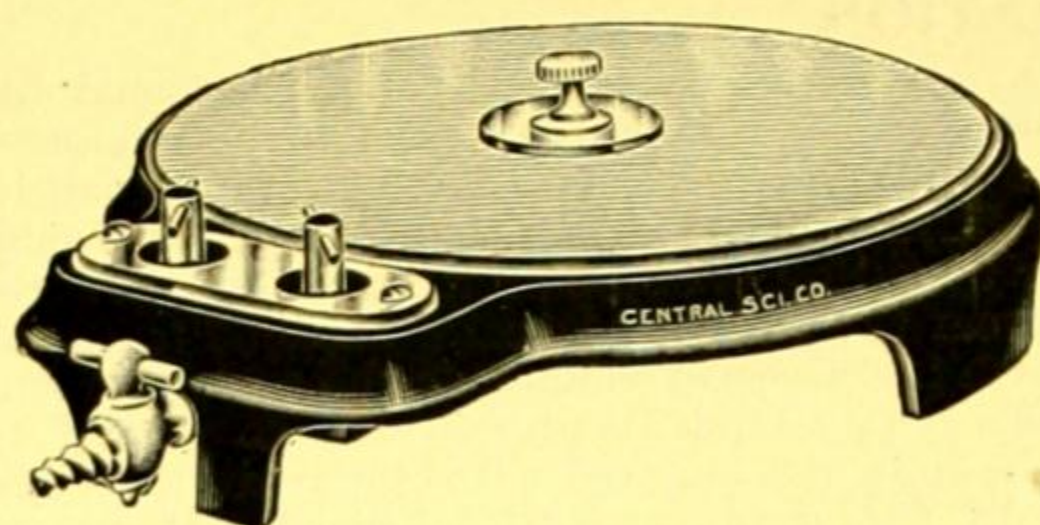
No. 10992.



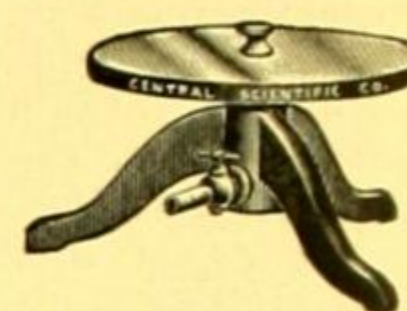
No. 10995.



No. 10994.



No. 11012.

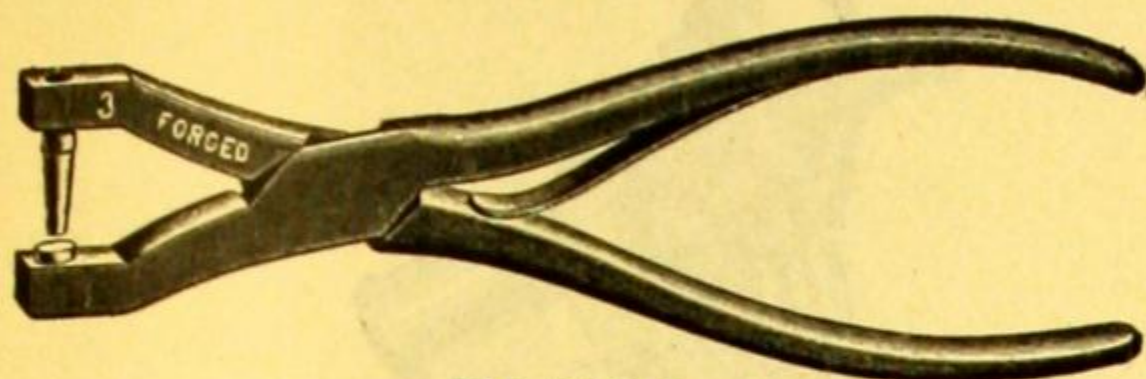


No. 11010.

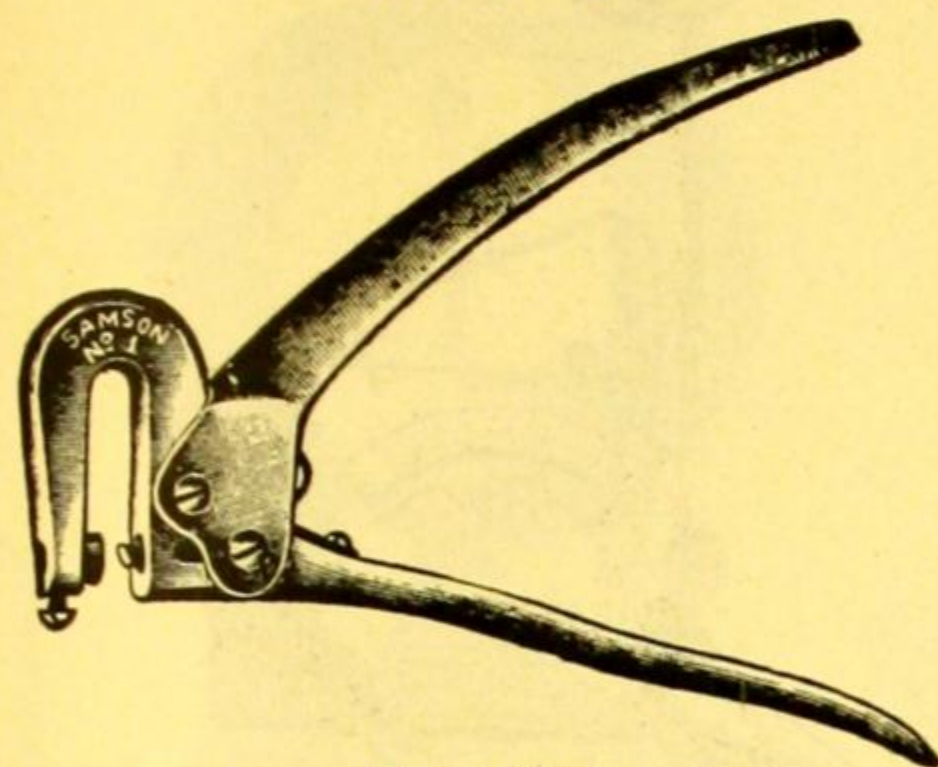
10992. **PUMP, AIR, Vacuum, Lever Action**, with two valves; polished brass cylinder, 56 mm diameter, stroke 16.5 cm; air pump plate of glass, 25 cm in diameter, ground plane and resting in a cast iron mold, with guard plug and vent screw; base and pillar of polished hardwood, mahogany finish. Base 25x60 cm. \$33.50
10994. **PUMP, AIR, Vacuum, Geryk Design**. This oil sealed pump is manufactured by us and has all the excellencies of this well-known design. It has no valves in the usual sense of the word, the pistons working in oil, which follows and seals the inlets and outlets so that leakage is impossible. The present model is finely constructed of brass and cast iron, handsomely finished, and is provided with a pump plate of plate glass 25 cm in diameter, cemented in the base. The air opening in the center of the pump plate is fitted with a safety plug which prevents the entrance of mercury and other undesirable substances, while permitting the free passage of air, and there is also another opening at the side of the base for attachment of pressure gages, etc. The piston is 48 mm in diameter with a 9 cm stroke and is operated by a hand wheel grooved for $\frac{1}{8}$ -in. round belt, as shown in the illustration. A vacuum of 0.15 mm may be obtained. 60.00
10995. **Countershaft**, for use with No. 10994 Air Pump when it is desired to use electric motor drive. This countershaft is mounted on No. F197 Clamp and when used with a $\frac{1}{8}$ horse power motor of 1800 r. p. m. with a $1\frac{1}{2}$ -inch pulley, will drive No. 10994 at about 55 r. p. m.... 6.75

AIR PUMP ACCESSORIES

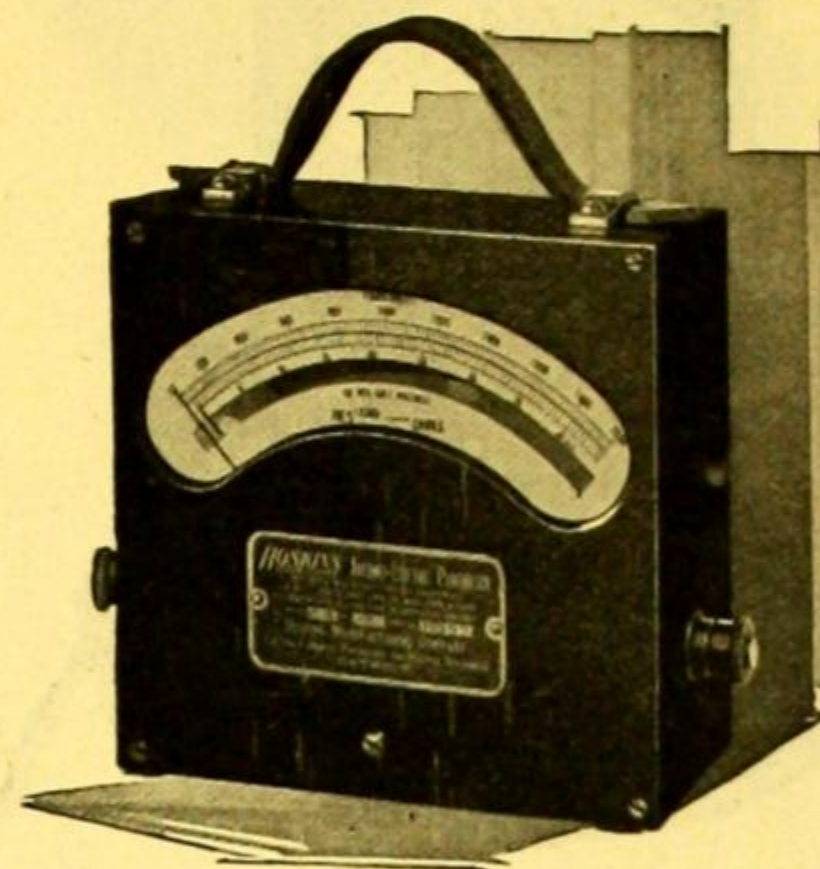
11010. **AIR PUMP PLATE**, of iron, 20 cm in diameter, cast in one piece to minimize danger of leakage. Ground plane and provided with brass stop-cock. The vent hole at the center is tapped ($\frac{7}{16}$ -16) for air pump accessories and provided with guard plug (No. F1941)..... 6.00
11012. **AIR PUMP PLATE**, of heavy plate glass, 25 cm in diameter; ground plane and firmly cemented in a low form tripod base of iron. The base is cast in one piece to minimize danger of leakage and provided with brass stop-cock and brass connecting tube with oil-sealed taps for inlet of air and for manometer. Finest workmanship throughout. The vent hole at the center is tapped ($\frac{7}{16}$ -16) for air pump accessories and provided with a guard plug (No. F1941).. 17.50
For **PRESSURE TUBING**, see general heading, **Rubber Tubing**.
11022. **OIL, Pump**. Especially adapted for lubricating air pump cylinders, for use in oil sealed pumps such as No. 10994 and for use in the Cenco-Nelson High Vacuum Pumps. In metal cans.
- | No. | A | B | C |
|---------|-------|-------|--------|
| Size | 1 pt. | 1 qt. | 1 gal. |
| Per can | .45 | .65 | 2.00 |
11023. **OIL, Pump**, for Cenco Hyvac Pumps, in metal cans.
- | No. | A | B | C |
|---------|-------|-------|--------|
| Size | 1 pt. | 1 qt. | 1 gal. |
| Per can | .45 | .65 | 2.00 |
11028. **VACUUM WAX**. The best preparation on the market for using on apparatus in connection with the Air Pump, especially where high vacua are desired. Will not injure the pump plate or apparatus. Will not harden and can therefore be easily removed. Superior to vaseline, tallow or heavy oil..... Per 4 oz. jar .30



No. 11042.



No. 11044.



No. 11124-11125.

11042. **PUNCH**, spring, cast steel, double joint; for leather, etc. Length, 7 $\frac{1}{4}$ inches..... \$0.85

11044. **PUNCH, Paper, Samson**. The most powerful hand punch made; will perforate anything from a thin sheet of steel to $\frac{1}{4}$ -inch paper. Nickel-plated and fitted with $\frac{3}{16}$ -inch die..... 3.50

PURINOMETER, see Urine Analysis Apparatus.

PYCNOMETERS, see Specific Gravity Bottles.

PYROMETERS

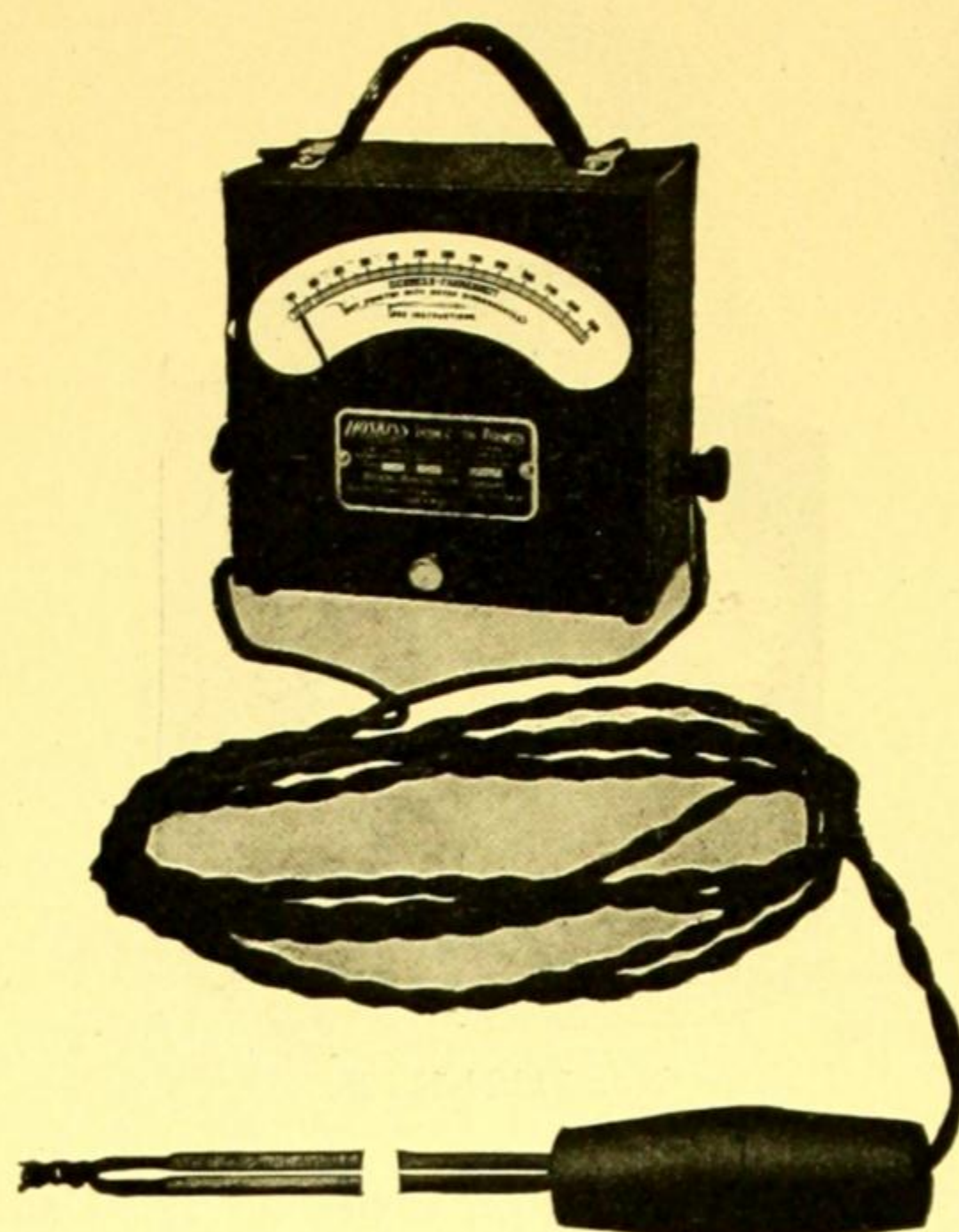
11124. **PYROMETER, Hoskin's High Resistance, Portable Type**, for use where more than 200 feet of connecting wire is used between the meter and the thermocouple. This meter is especially recommended for use about industrial furnaces where it is necessary to remove the cold end of the couple a considerable distance to reach a place of constant temperature. Variations of several ohms in the resistance of the external circuit will not affect the accuracy of the pyrometer readings. The indicating instrument is a ruggedly constructed D'Arsonval type millivoltmeter having a resistance of approximately 320 ohms and a negligible temperature coefficient. It is provided with a double scale for indicating both temperatures and millivolts from 32° to 2500° Fahrenheit and from 0 to 54 millivolts. A mirror is placed between the scales to enable more accurate readings to be made free from the errors of parallax. A zero-adjusting device permits the setting of the pointer to correspond to the temperature of the cold-end of the thermocouple before connecting the circuit. The case is of aluminum, black enameled and dust proof, measuring 6 $\frac{1}{4}$ x6x3 inches over all. It weighs 5 pounds. The thermocouple consists of two 8-gage wires, one of Chromel and the other of Alumel, welded together at one end and provided with a connector block at the other end for the attachment of the flexible connecting wires. The wires of the thermocouple are separated and insulated by a number of fire-clay insulators, each 1 inch long. The couple furnished is 3 feet long and for accurate temperature indication, must be used with not less than 10 feet of No. 11126 Flexible Connecting Wire. Complete with couple, insulator beads and couple connector, but **without flexible connecting wire** 79.60

11125. **PYROMETER, Hoskins High Resistance, Portable Type**, same as No. 11124 but with scale graduated in Centigrade degrees from 0 to 1400° by 20° divisions with couple, insulator beads and couple connector, but **without flexible connecting wire** 79.60

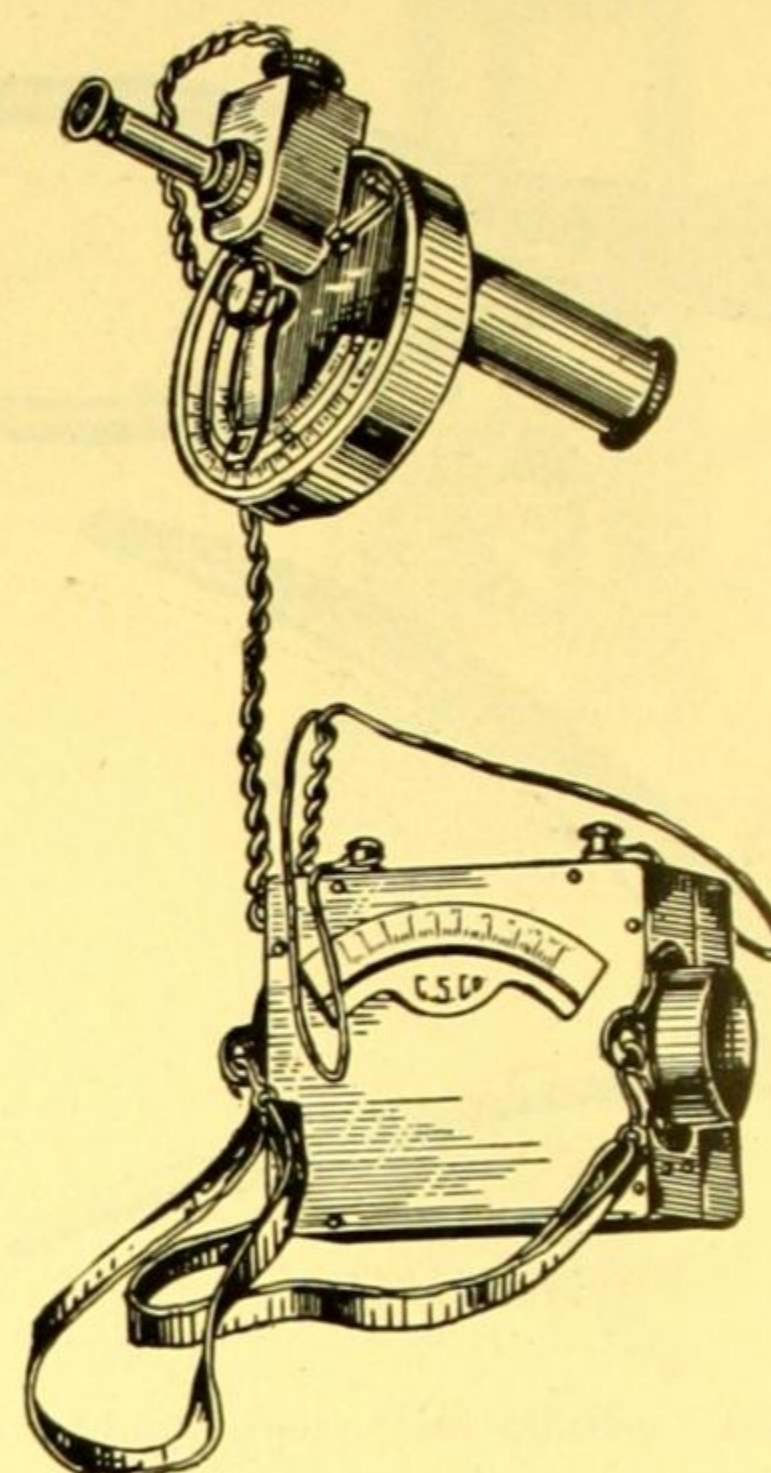
11126. **Flexible Connecting Wire**, Chromel-Alumel No. 14 B. & S. for use with Nos. 11124-5 High Resistance Pyrometers in connection with the Chromel-Alumel Thermocouple. Not sold in lengths of less than 10 feet.....per 10 foot length 3.00

11127. **Thermocouples**, Chromel-Alumel with welded joint for replacement in Nos. 11124-5 High Resistance Pyrometer equipments. These thermocouples are of guaranteed millivoltage and are interchangeable with all Nos. 11124-5 High Resistance Pyrometers without recalibration. Length, 3 feet. **Without fire-clay insulators**..... 2.80

11128. **Insulators** of fire-clay with two holes for separating and insulating the two wires of No. 11127 Thermocouples. Length, 1 inch.....per dozen .40



Nos. 11130-2.



No. 11144.

11130. **PYROMETERS, Hoskins Low Resistance, Portable Type.** The most satisfactory instrument for general laboratory purposes in connection with laboratory muffle furnaces, combustion furnaces, etc. The standard equipment for this instrument consists of a 3-foot Chromel-Alumel thermocouple with 20 feet of flexible copper connecting wires calibrated to 1 ohm resistance. If a greater length of connecting wire is used it is necessary to readjust the resistance of the lead to 1 ohm by changing the lead calibration spool in the handle of the thermocouple. The millivoltmeter is of the same general design and construction as that of No. 11124 except that the internal resistance is approximately 8 ohms.

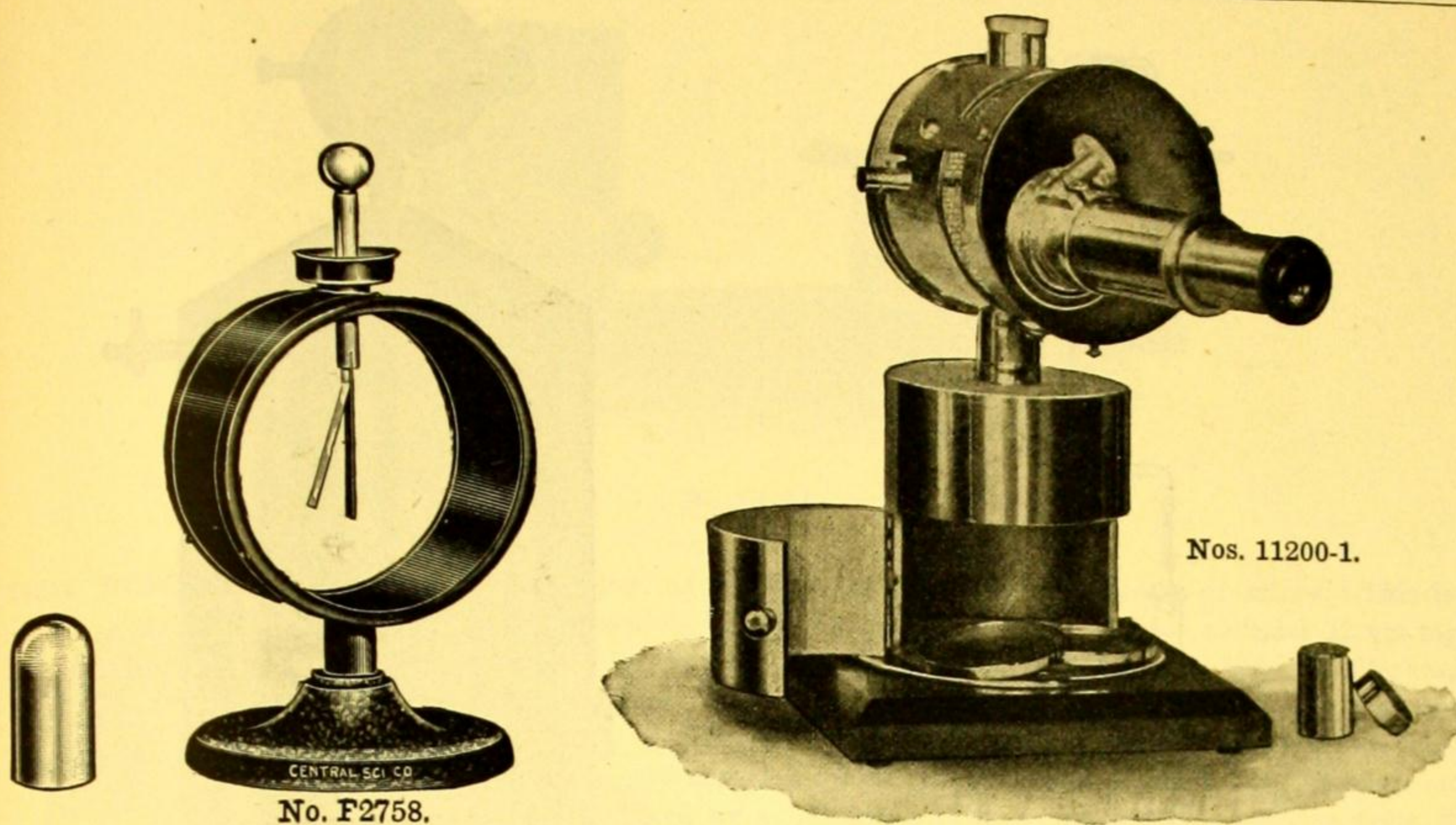
No.	A	D
Range, 32 to, degrees F.	1000	2500
Graduated to, degrees F.	10	25
Each	\$67.30	67.30

11132. **PYROMETER, Hoskins Low Resistance, Portable Type,** same as No. 11130 but with scale graduated in Centigrade degrees.

No.	A	D
Range, 0 to, degrees C.	550	1400
Graduated to, degrees C.	5	20
Each	\$67.30	67.30

11144. **PYROMETER, F. & F. Optical,** for the measurement of temperatures above the range of thermocouple pyrometers or of moving objects such as steel passing through rolls. An optical pyrometer with a temperature scale based upon Wien's law for the distribution, in the spectrum, of the energy of a black body. The instrument consists of a telescope with a special lamp with a hairpin type of filament mounted in the focal plane of the objective in such a manner that the tip is viewed through the ocular lens by the observer. When the instrument is sighted on an object the image of the filament is superimposed upon the image of the object. The brightness of the filament is set at a definite value by setting the current that flows through it at a standard value. The brightness of the object is then adjusted to match that of the lamp by adjusting a circular wedge of black absorbing glass in the instrument by means of the knurled head knob under the viewing telescope. The movement of the wedge is indicated by the index attached to the adjusting knob. This index travels over a scale graduated directly in degrees Fahrenheit from 1600° to 4000°. The lamp filament burns at only 800°C. and its calibration can not alter even after years of constant use. The precision ammeter, battery and rheostat for making the normal setting, are contained in a single, small, portable carrying case. The current is supplied by dry cells. Complete pyrometer with battery, rheostat and ammeter

11145. **Lamp,** for replacement in No. 11144 Optical Pyrometer 5.00



RACKS, All Kinds, see Supports.

RACKS, Milk Test Bottle, see Milk Testing Apparatus.

RADIO-ACTIVITY APPARATUS

F2758. ELECTROSCOPE, Box Form. Consists of a cylindrical metal box about 10 cm in diameter with removable glass front and back. Because of its shape, it can be readily used in connection with a projection lantern for classroom demonstration. The brass rod carrying the strips of gold-foil is insulated by pure amber, giving the best insulation possible. To obviate radioactive influences, a metal cap is provided to fit over the collar on top of the box and enclose the projecting rod. This electroscope will retain its charge for from 6 to 8 days.... \$6.00

ELECTROSCOPE, Lind Interchangeable, as used by the United States Bureau of Mines. This instrument can be assembled to suit the needs of the operator from the parts described below. (See Bulletin 104, United States Bureau of Mines, Chapter V.)

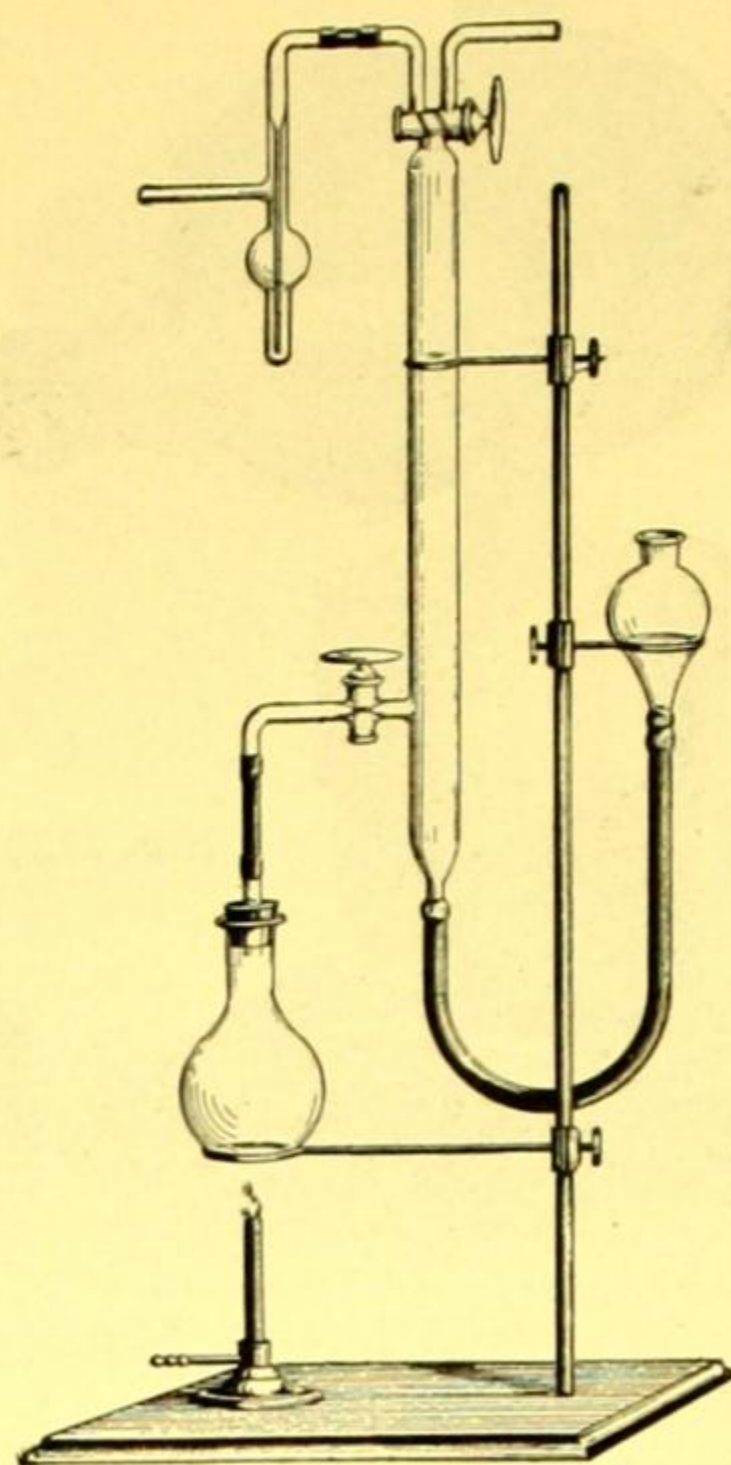
11200. ELECTROSCOPE HEAD, consisting of a nickel-plated housing containing the leaf system and supporting the reading microscope. It is closed in the front and rear by sheet mica. A fine wire grating makes contact with the mica to ground stray charges. The leaf system is insulated by means of an amberoid plug, fitted into a threaded cap, by means of which the leaf may be readily removed. The aluminum leaf is charged by means of a rod set in hard rubber at the right-hand side. Opposite, on the left, is a protector for the leaf when in transportation, which should be withdrawn to full distance when in use. At the bottom of the leaf support is a light spring, to make electrical contact with the interchangeable discharge chambers.

The Microscope, magnification, 24-fold; focal distance 32 mm, is carried by a projecting solid front, and is very firmly fixed with relation to the leaf. It may be refocused, however, by releasing a split collar controlled by a heavy milled-head screw. The microscope has a graduated and numbered micrometer scale in the eye-piece by which the motion of the leaf is measured.

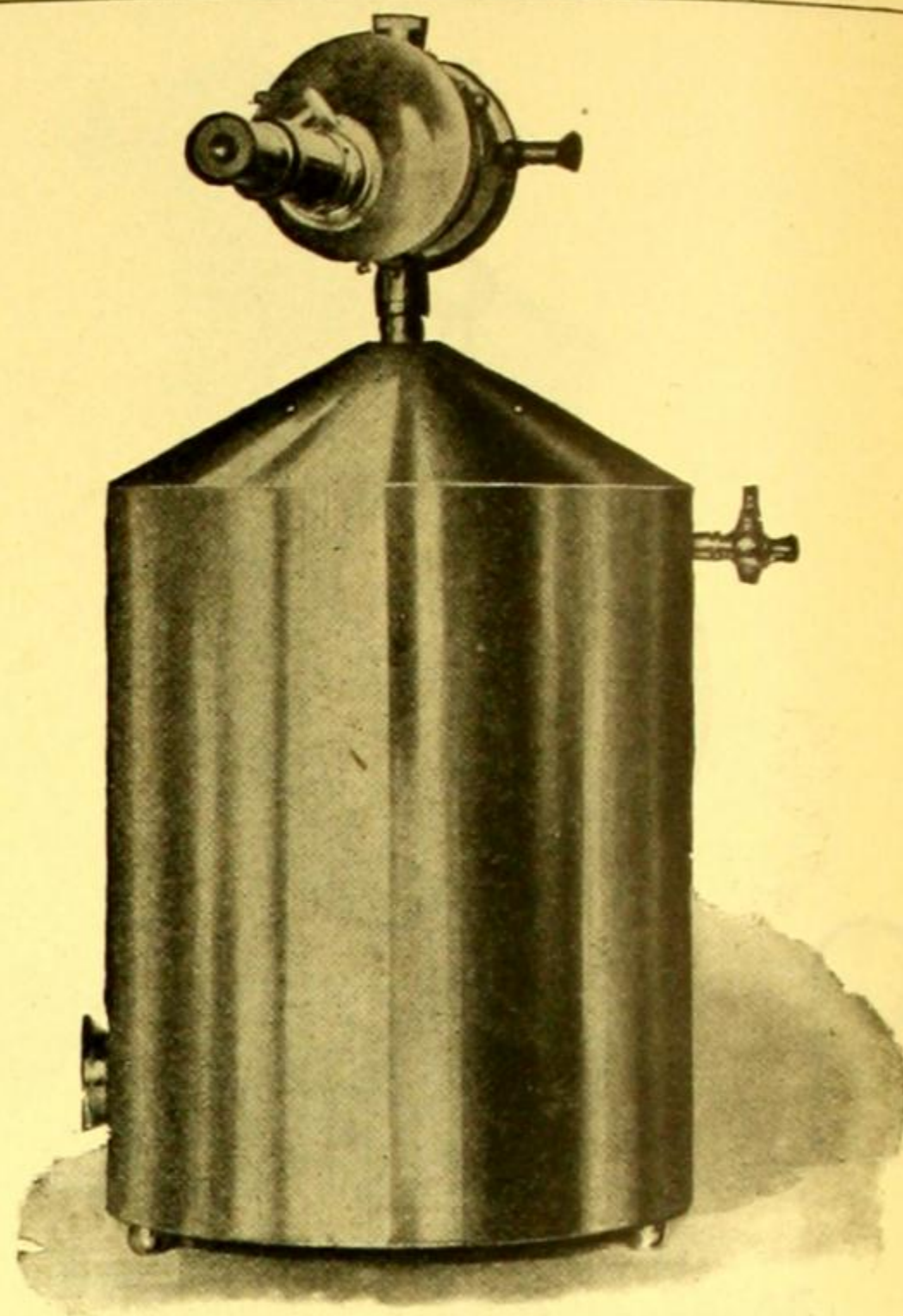
The Head as a whole comprises a very compact readily transportable unit, and yet one that can be easily taken apart if it is desired to do so. Complete as described..... 63.00

11201. OPEN DISCHARGE CHAMBER FOR SOLIDS, a cylinder for use with Head No. 11200, 10.5 cm high, 9 cm in diameter, with a door 5 cm high, and 9 cm broad. The plate electrode is 5.5 cm in diameter and is supported horizontally at 1.5 cm below the top of the chamber, by a rod that passes up through an amberoid insulator, and terminates in a cap to fit the interchangeable top. The chamber is provided with a friction cap to protect the insulator when not in use..... 15.00

11202. GAS-TIGHT EMANATION CHAMBER, for use with Head No. 11200, 10.5 cm high, 9 cm in diameter, provided with two special gas-tight stop-cocks. Volume, about $\frac{1}{2}$ liter. The amberoid insulation is made gas-tight by a special mechanical joint without any wax or other binding material. Since each emanation chamber can be used only once daily, as many duplications must be provided as it is desired to make daily determinations, all being used with one top. At least one extra Charging Cap No. 11210 is needed with more than one chamber. 18.75

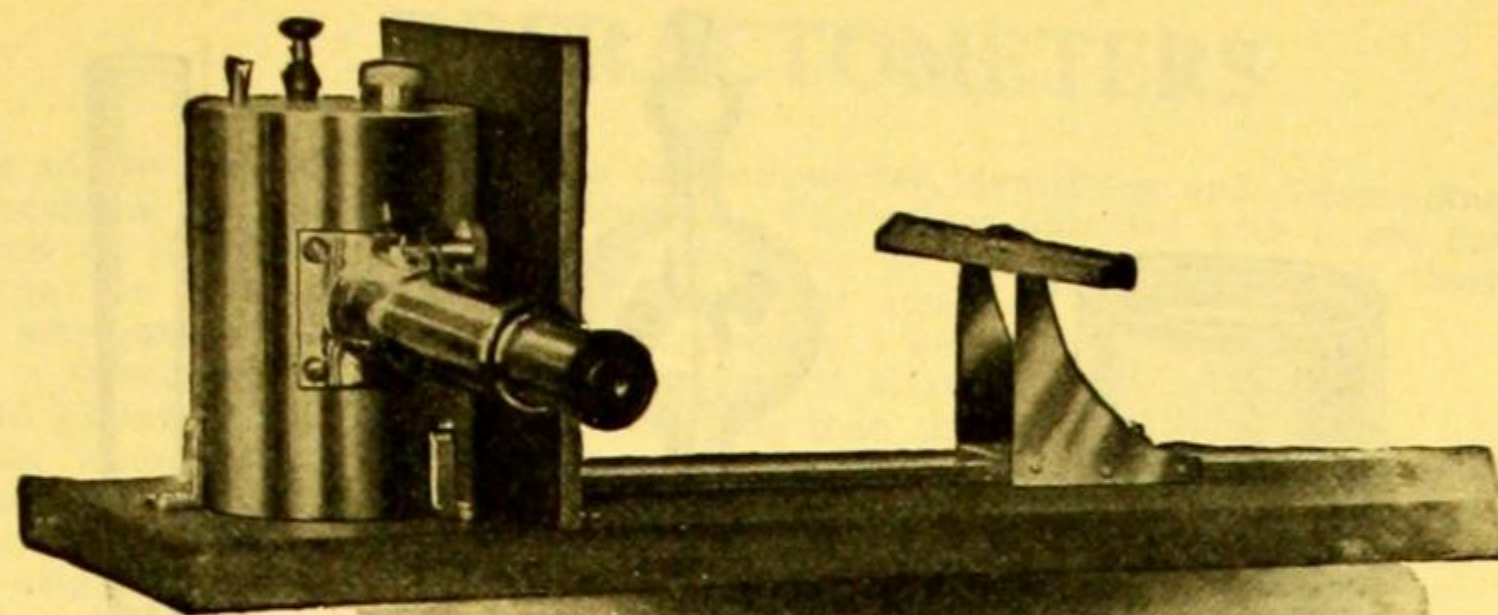


No. 11208.



No. 11203 with No. 11200 mounted on it.

11203. **LIGHT WALLED WATER CHAMBER**, height, 13 inches; diameter, 10 inches; weight, 4 pounds; capacity, about 4 gallons. Intended especially for field use with Head No. 11200, where water is introduced directly into the chambers. Amberoid insulation, stop-cock outlet above, and large opening below, with rubber stopper for introduction of water..... \$15.00
11205. **PLATE FOR SOLIDS**, 5.5 cm in diameter with narrow rim 2 mm deep, to be used with No. 11201. At least two, and probably more, are desirableeach 1.25
11206. **CHARGING ROD**, a tapering rod of hard rubber 8 inches long, for charging in field work and where battery is not available..... .25
11207. **BATTERY SET**, consisting of dry cells connected in series, in covered wooden box, with insulated wire to guard one end of battery, charging wire with floating terminal and knife switch to protect whole. Dimensions of box, 18x15x6 inches..... 53.00
11208. **GAS BURETTES FOR EMANATION**, a glass burette with one capillary two-way stop-cock above and one wide-bore cock below. Length of burette, 60 cm; diameter, 3 cm; length over all, 80 cm. Two are desirable for rapid workeach 10.00
11209. **MICRO-DRYING BULBS for Sulphuric Acid**, to be used between Nos. 11202 and 11208 in transferring gases. One is needed for each gas burette..... 1.50
11210. **CHARGING CAP**, of hard rubber with binding post, to be used in maintaining charge on No. 11202 when Head No. 11200 is in use..... 1.50
11211. **HAND PUMP, Vacuum or Pressure**, of special construction for use in evacuating No. 11202 Chamber 12.50
11212. **WRENCH** for removing electrode collars from Chambers Nos. 11201 to 11203..... 1.10
6036. **ALUMINUM FOIL**, in books of 25 leaves, 5x5 inchesper book .25
11214. **WOODEN SUPPORT** for No. 11200, when not on chamber..... 3.00
12962. **STOP WATCH**, 7 jewelled..... 12.50
11218. **ANALYZED LE DOUX CARNOTITE** (about 1.5% U_3O_8), to be used in No. 11205 Plates in Chamber No. 11201 for solid comparison.....per 25 grams 1.50
11219. **ANALYZED LE DOUX CARNOTITE** (about 2% U_3O_8).....per 25 grams 2.00
11220. **ANALYZED LE DOUX CARNOTITE** (about 3% U_3O_8).....per 25 grams 3.00
11226. **COMPLETE LABORATORY OUTFIT for Solids, Gases (Emanation Method) and Liquids (Water)**, consisting of one each Nos. 11200, 11201, 11206, 11207, 11211, 11212, 6036, 11214, 11218, 11219, 11220, and two each Nos. 11202, 11205, 11208, 11209 and 11210..... 224.75

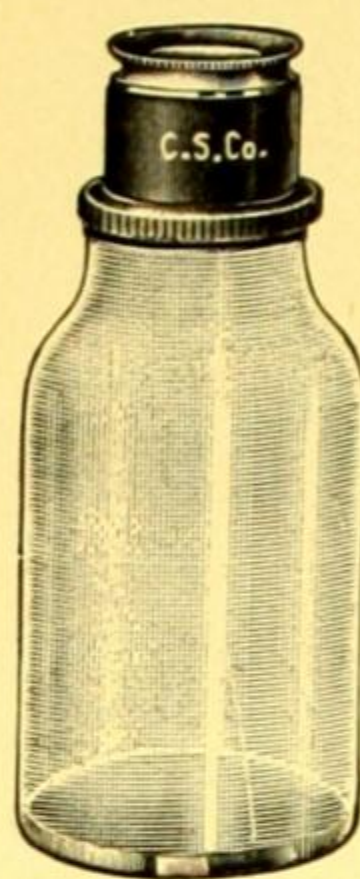


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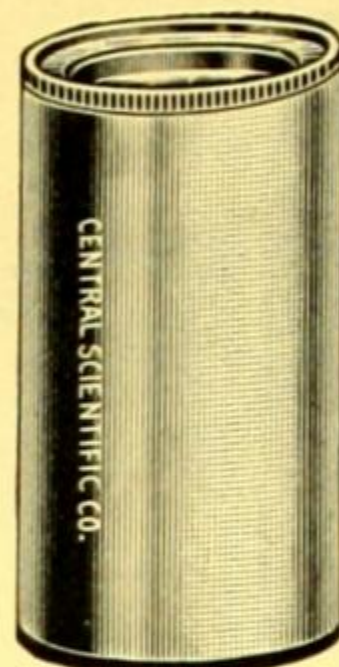
11244. **ELECTROSCOPE, Lind Gamma Ray**, as used by the United States Bureau of Mines. This is a single unit outfit, not interchangeable, consisting of a nickel-plated brass cylinder 13 cm high and 9 cm in diameter, with lead lining inside 3 mm thick. The leaf system is in the discharge chamber itself, into which is also fixed, by means of a split collar with heavy screw, the reading microscope with numbered scale. The chamber is mounted on one end of a wooden base 33 x 6 inches, along which extends a nickel-plated track 27 inches long on which a light carriage support for the radium tube may be fixed by a binding screw at any desired distance from the discharge chamber. The carriage supports the radium tube horizontally at a height just opposite the middle of the chamber. The radium tube is held by a light spring clip against a concave bar, graduated in $\frac{1}{16}$ inch divisions, to facilitate centering the tube and determining its length. A removable lead screen 6 x 6 x $\frac{1}{4}$ inches is placed immediately against the discharge chamber, to shield it from the radium tube. Complete as described. (See Bulletin 104, of the United States Bureau of Mines, Chapter V)..... \$80.00
11246. **ELECTROSCOPE, Gamma Ray Outfit**, for the measurement of tubes of radium or of emanation, suitable for use by physicians and hospitals, consisting of Gamma Ray Electroscopic No. 11244, Stop Watch No. 12962 and Charging Rod No. 11206 92.75

MINERALS FOR RADIO-ACTIVITY

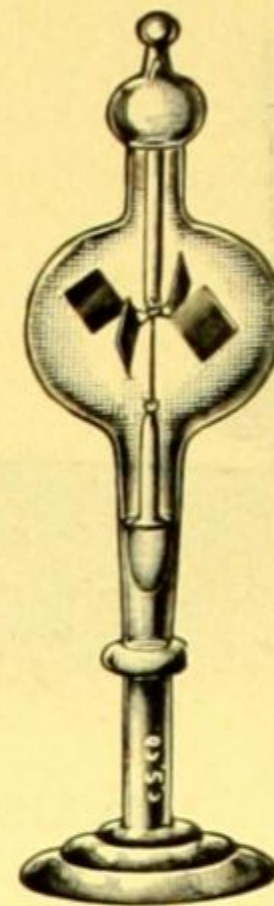
11250. **CALC-SPAR**, in pieces about 40 x 15 x 6 mm.....per piece .75
11251. **CARNOTITE (Radium Ore)**. High grade specimens.
- | | |
|------------|--------|
| No. | B |
| Size | Medium |
| Each | 1.00 |
11252. **FLUORSPAR CUBES**, approximately 13 mm on a side.....per cube .50
11253. **KUNZITE**, fluorescent.....per 6 grams 3.75
11255. **THORIUM NITRATE**.....per ounce .50
11258. **URANIUM NITRATE**.....per ounce .40
11259. **URANIUM OXIDE (yellow)**.....per ounce .45
11261. **WILLEMITE**, Fluorescent.....per ounce .75
11262. **WILLEMITE**, Phosphorescent.....per ounce .75
11264. **ZINC SULPHIDE, PHOSPHORESCENT**, extra strong phosphorescence; produces very large scintillations with radium. In vials of 5 grams.....Per vial 2.00
11265. **ZINC SULPHIDE, PHOSPHORESCENT**, strong phosphorescence. In vials of 5 grams.....Per vial 1.00
11266. **ZINC SULPHIDE, TRIBOLUMINESCENT**. Shows a marked luminosity when rubbed; is also phosphorescent. In vials of 5 grams.....Per vial 2.00



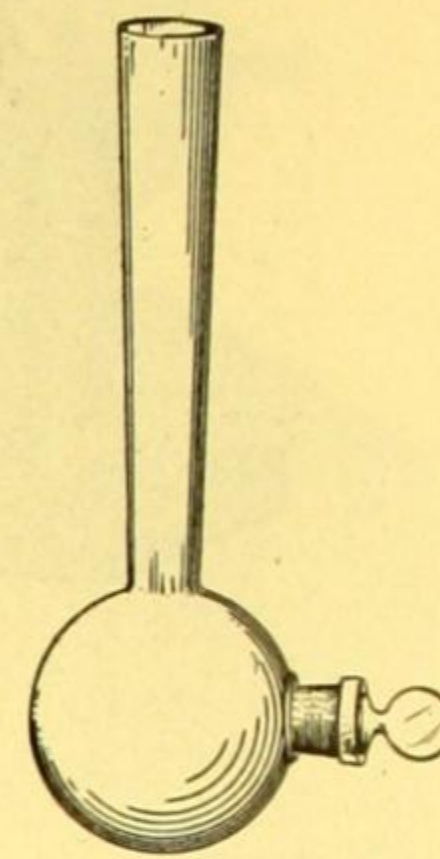
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No. 11284.



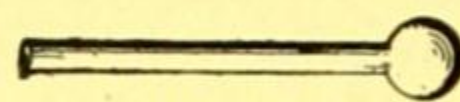
No. F2177.



No. 11304.



No. 11314.



No. 11320.



No. 11322A.

11280. **RADIOSCOPE**, for detecting the presence of radio-activity in waters, ores, etc., by viewing scintillations on a phosphorescent screen. These scintillations are produced by the alpha particles emitted by the emanation evolved from radio-active substances. The instrument consists of a jar for holding the substance under test, provided with a screw cap fitted with an adjustable compound lens and a phosphorescent zinc sulphide screen. The emanation rises from the jar into the cap and there causes scintillations on the screen. With each Radioscope is supplied a quantity of high grade carnotite (radium) ore which may be used to learn the use of the instrument. Size 20x7.5 cm..... \$10.00

11284. **SPINTHARISCOPE**, for showing the radiant energy of radium salt. Consists of a nickel-plated metal tube, 19x35 mm, with a phosphorescent screen at one end and a high grade lens at the other. Projecting from the center of the phosphorescent screen is a pin on the side of which has been placed a small quantity of radium salt. With this instrument the scintillations produced on the phosphorescent screen by the constantly emanating alpha particles are shown in the most marvelous manner. In order to observe this phenomenon in the day time the observer should remain in a darkened room for a short time, so that the eye may become sufficiently sensitive 4.00

F2177. **RADIOMETER**, Crookes', illustrating phenomena of radiant heat. Mounted on glass base 2.50

RAW MATERIALS, see list at end of letter W.

RAZORS, Section, see **Microtome Accessories**.

READING GLASSES, see **Magnifiers**.

READING TELESCOPES, see **Catalog F of Physical Apparatus**.

REAGENT BOTTLES, see **Bottles**.

RECALESCENCE OUTFIT, see **Furnaces, Electric; Pyrometers; or write for special information**.

RECEIVER, Distilling, see No. 4166 under general heading **Distilling Apparatus**.

11304. **RECEIVERS**, Retort, glass, with tubulature and glass stopper.

Capacity, cc.....	125	250	500	1000
Each	.60	.65	1.00	1.10

RECEIVERS for Blowers, see **Blowers**.

RECTIFIERS, see **Electrical Instruments**.

11314. **REDUCTOR**, Blair or Jones, for the determination of phosphorus in steel, by the zinc filtration method. With glass stop-cock. (See Blair's Analysis of Iron, 8th Edition, page 89.)... 2.50

11320. **REDUCTION TUBE**, of Pyrex hard glass, with bulb on end. Length, 15 cm..... .25

11322A. **REDUCTION TUBE**, of Pyrex hard glass, with bulb in center. Length, 300 mm..... .50

REFRACTOMETERS

The importance of the refractometer as an instrument for identifying and determining the purity of substances has been little appreciated in the average laboratory. The values obtained with it are the result of a very delicate and intimate reaction of the light waves on the molecules of the substance and of their configuration within the substance. Therefore the refractive index will stand for some very characteristic attributes of the substance in question. The refractive index of a substance at a given temperature, if measured to four decimal places, is much more characteristic than the specific gravity, even when measured by the most refined equipment. Certain industries, realizing the superiority of the refractive index measurements to other physical methods of analysis have adapted the original Abbe refractometer to their specific work by making the scale direct reading. Among the substances controlled by it are butter, edible and technical fats, oils, waxes, sugar, syrups, essential oils, glue, gelatine, petroleum, varnish, drugs, etc. To assist the industrial chemist in applying the refractometer to his work, we list under Nos. 11406, 11407 and 11408 three volumes of tables of refractive indices of technical products.

The **Abbe Refractometer** for liquids, plastic bodies and solids, is particularly well adapted to the requirements of the commercial laboratory as it is direct reading over a wide range, giving results accurate to 0.0001. No accessory lamps are required, as the measurements can be made with daylight or artificial light. Only one or two drops of liquid are required for a test and, in the instrument, this small quantity of liquid is spread into so thin a film that turbid and highly colored liquids, which would absorb too much light to be examined in other types of refractometers, may be investigated without difficulty. The time consumed in making a measurement with the Abbe instrument is shorter than that required for making any other physical measurement. A second physical measurement, the mean dispersion, or the difference in the refractive indices for the Fraunhofer lines C and F, can be simultaneously made with this instrument.

The essential parts of the Abbe Refractometer are:

1. The **double Abbe prism**, made of glass of high refractive index, which contains the fluid and can be rotated on a horizontal axis by means of an alidade or arm whose position is indicated by a graduated sector.
2. A **telescope** for observing the border-line of total reflection.
3. A **compensator** for conversion of the band of color at the border-line of total reflection into a colorless line, sharply dividing the bright and dark portions of the field. The graduated scale on the compensator furnishes readings from which the mean dispersion is obtained from tables accompanying each instrument.
4. A **sector**, rigidly connected with the telescope, on which divisions, representing refractive indices, are engraved.

11328. REFRACTOMETER, Abbe-Spencer, an improved design of the original Abbe instrument with several special features not found on similar instruments of other manufacture. The three outstanding features are:

A rack-and-pinion on the movable arm for the precise adjustment of the border line to the cross hairs in the telescope, which allows more accurate settings to be made in a shorter time than with the friction held arm.

A vernier on the compensator prism drum for reading the angular rotation of the Amici prisms to 18 minutes of arc, which is an invaluable aid in accurate dispersion determinations.

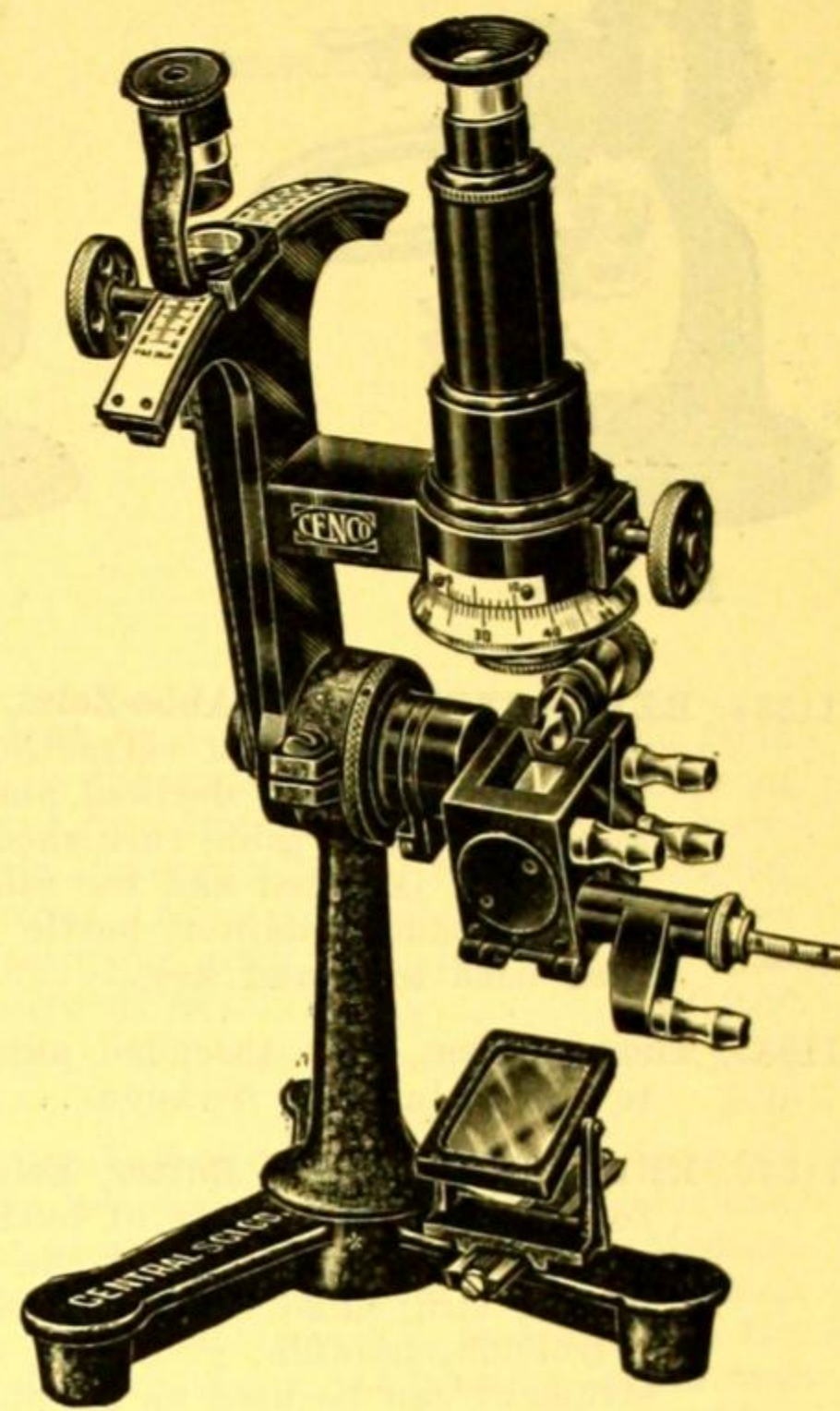
A mirror mounted to slide on a horizontal bar, which greatly facilitates obtaining light in various positions.

The Abbe prisms are water jacketed for accurately controlling the temperature of the substance under investigation. The scale is graduated in indices of refraction for the D line from 1.300 to 1.710 directly to the third decimal place; the fourth decimal place can be estimated to one or two units. Mean dispersions can be obtained to four decimal places from the table accompanying the instrument. Complete, with test plate, thermometer with threaded adapter, bottle of monobrom naphthalene and dispersion tables, in hardwood case with lock and key. \$250.00

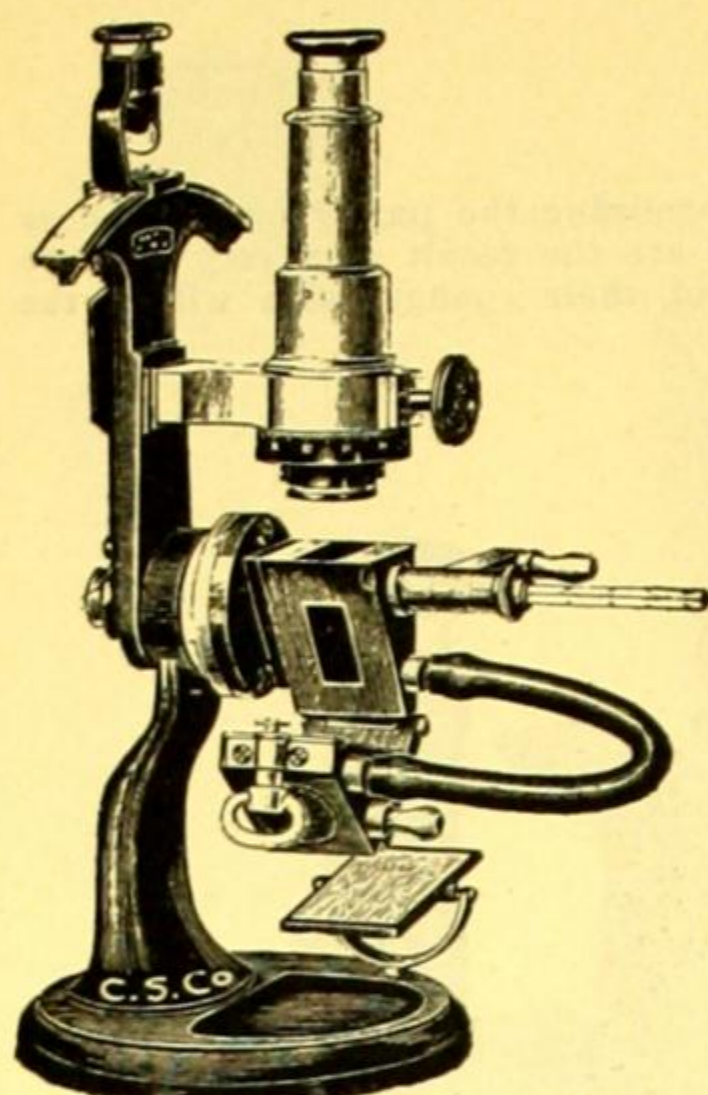
11329. REFRACTOMETER, Abbe-Spencer, same as No. 11328 but with scale reading directly in per cent. of dry substance in sugar juices, for rapid work in sugar analysis without the use of conversion tables. Adjusted for a temperature of 20° C. 265.00

11330. Thermometer, with threaded adapter for use on Nos. 11328 and 11329. Scale etched on stem from 0° to 75° C. in $\frac{1}{10}^{\circ}$ C. divisions. 12.75

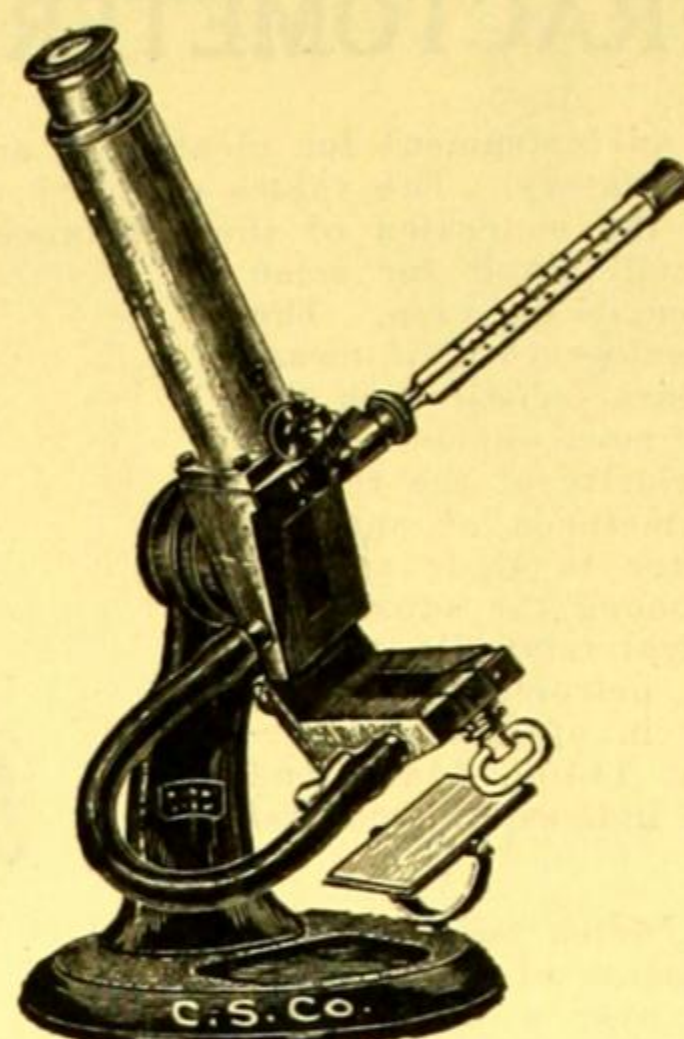
Prices on Nos. 11328, 11329 and 11330 subject to 10 per cent. discount to hospitals and educational institutions.



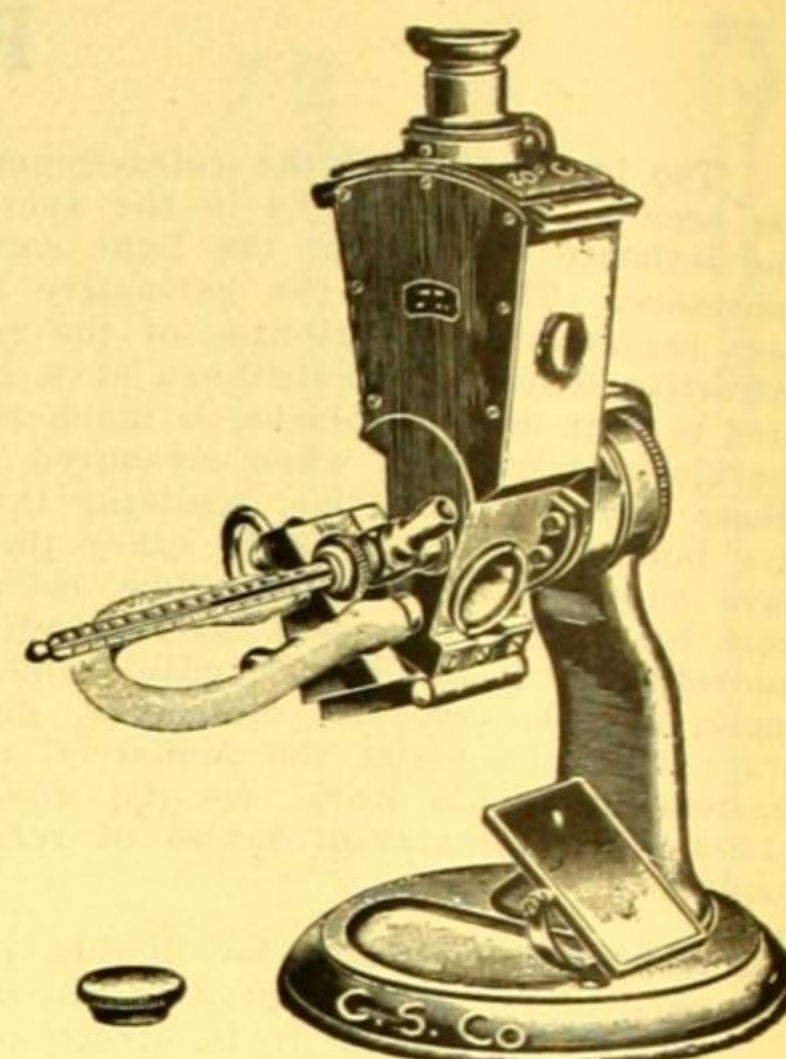
Nos. 11328-9.



No. 11334.



No. 11340.



No. 11346.

11334. **REFRACTOMETER, Abbe-Zeiss**, the product of the original manufacturer of this type of instrument. Indices of refraction can be measured from $n_D = 1.3$ to $n_D = 1.7$ within two units in the fourth decimal place and mean dispersions ($n_F - n_C$) may be arrived at by the aid of a special table furnished with the instrument, to the same accuracy. The Abbe prisms are water jacketed and the alidade is friction held. Complete with test plate, thermometer with threaded adapter, bottle of monobrom naphthalene and dispersion tables, in hardwood case with lock and key..... \$290.50

11335. **Thermometer**, with threaded adapter for use on No. 11334. Scale engraved on stem from 0° to 75° C. in 1° C. divisions..... 3.25

11340. **REFRACTOMETER, Butter, Zeiss**. A special form of Abbe refractometer, designed especially for checking the purity of butter by means of its refractive index. Its use is not, however, restricted to butter, as it can be used for other products such as: cheese, margarine, cocoa butter, lard, salad oil, cod liver oil, lubricating oil, alkalies, linseed oil, varnish, turpentine, petroleum, paraffin, glycerine, ceresin and other forms of wax. Generally speaking, this instrument can be used on all fluids or solids capable of being made fluid and having refractive indices between 1.418 and 1.492. Ordinary examinations should be made with daylight as the examinations of the bands of color are of particular advantage in comparing two substances having nearly the same index of refraction but different dispersions. A broad red band invariably signifies relatively low dispersion, while a broad blue band is always the sign of relatively high dispersion. When measuring the index of refraction of turpentine, linseed oil, etc., the band of color is so broad that exact reading is impossible. In such cases it is advisable to use a sodium flame as a light source.

The refractometer consists of a water jacketed Abbe double prism permanently attached to a telescope, the objective of which is adjustable in a slide by means of a micrometer screw. A scale, graduated from -5.0 to $+105.0$, is placed in the focal plane of the telescope objective. By adjusting the ocular of the telescope the lines and figures of the scale are sharply focused. The scale readings are converted to indices of refraction, accurate to four decimal places, by reference to a conversion table supplied with each instrument. Complete with bottle of standardizing fluid, conversion tables, thermometer with threaded adapter and directions for use, in hardwood case 146.50

11341. **Thermometer**, with threaded adapter, for use with No. 11340. Graduated from 0° to 50° C. by $\frac{1}{2}^\circ$ C. 3.25

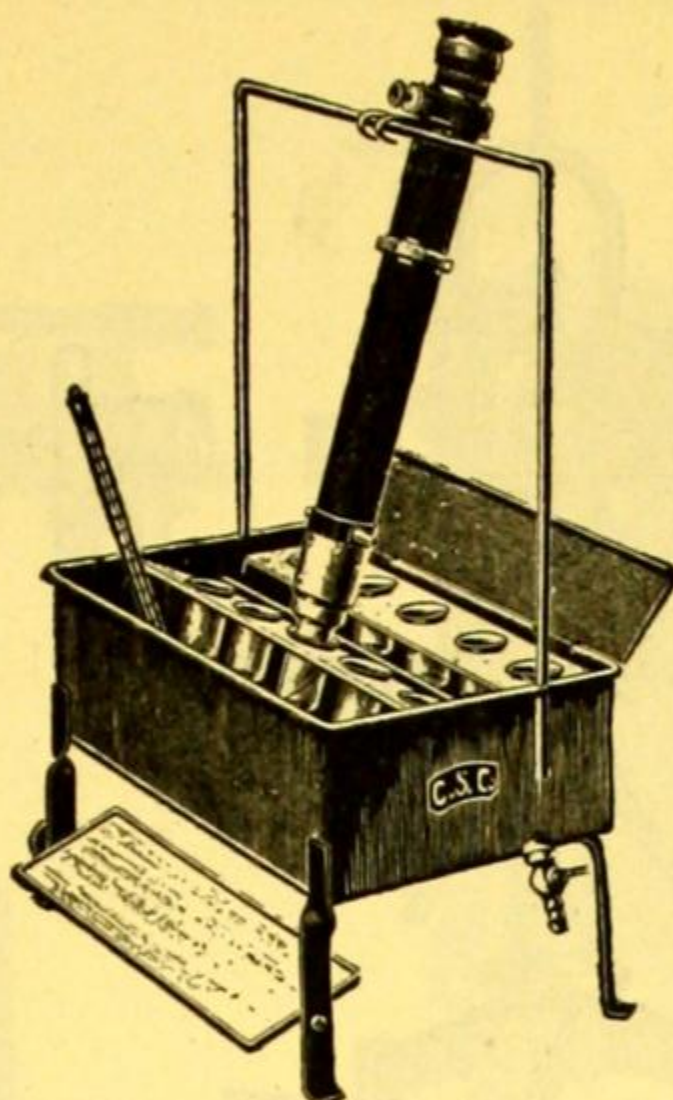
11342. **Thermometer, Baier**, with threaded adapter, for use with No. 11340. Reading in maximum butter refractometer scale values of pure butter for various temperatures. Three scales are provided: one for summer butter, one for winter butter and one (in red) for lard.... 6.50

11346. **REFRACTOMETER, Sugar, Zeiss**. A special form of Abbe refractometer adapted to the requirements of the sugar chemist. The scale on this instrument is divided to read directly in per cent. of dry substance in sugar solutions. Special prisms, admitting more light than those of the Abbe refractometer, are employed in its construction to facilitate accurate reading of the scale, when dark solutions such as molasses are under examination. A window, entering on the upper prism and usually closed by a metal cap, permits the admission of light to illuminate the scale when used with solutions so deeply colored that insufficient light is admitted to make accurate readings.

(Continued on next page.)



No. 11346.

Nos. 11360 or 11365 with
No. 11367.**REFRACTOMETER, Sugar, Zeiss, Continued.**

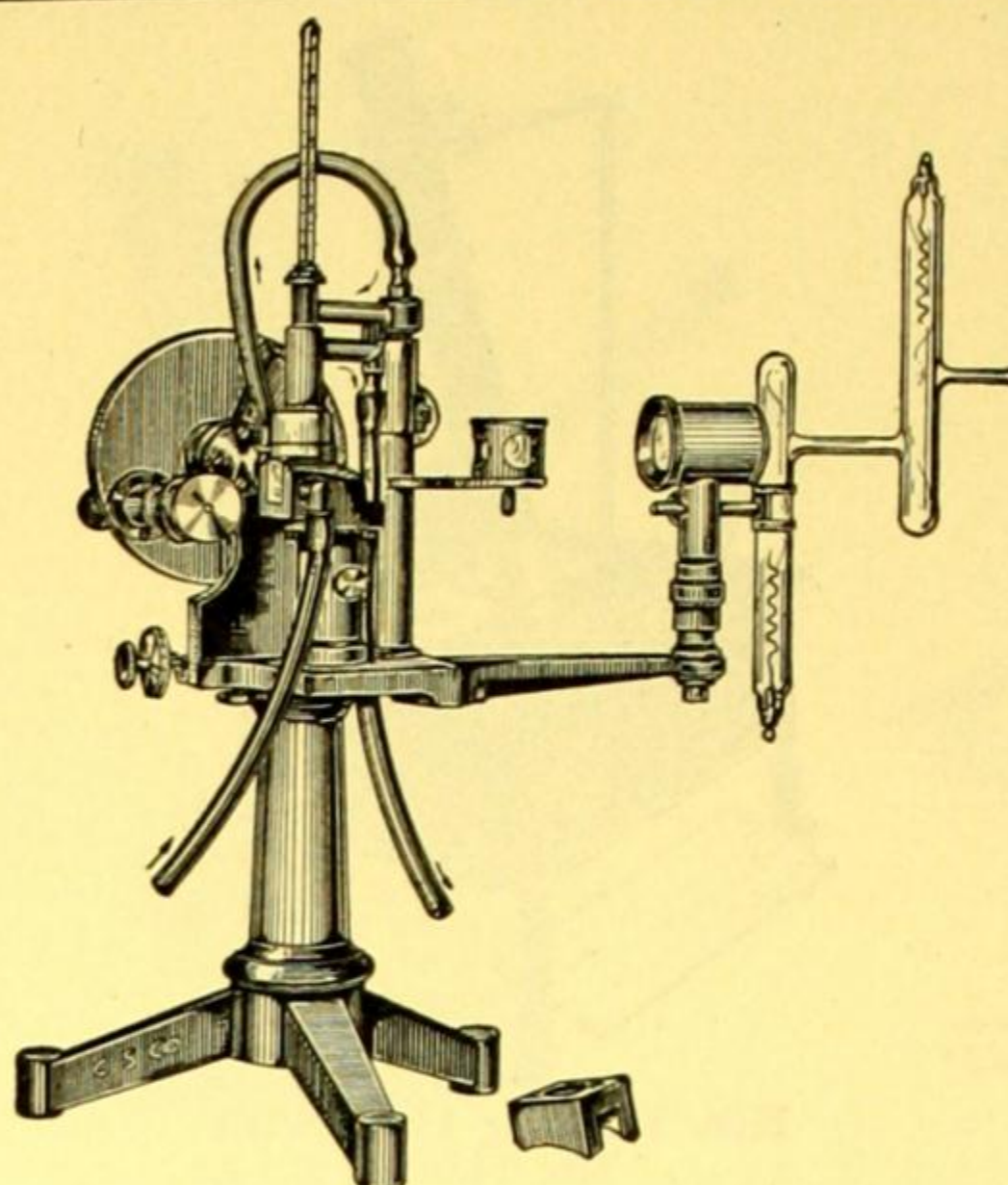
The transparent graduated scale, divided from 0 to 50 per cent. by 1 per cent. divisions and from 50 to 85 per cent. by $\frac{1}{2}$ per cent. divisions, is mounted in the upper part of the dust proof case, in the field of the movable telescope. The scales, on the instruments carried in stock, are adjusted to give correct readings at 20° C., but if this instrument is for use in the tropics, a scale adjusted for 28° C. can be supplied on special order. A temperature correction table is supplied with each instrument. Complete with thermometer with threaded adapter, temperature correction table and directions for use; in hardwood case.....\$219.50

11347. **Thermometer**, with threaded adapter, for use with No. 11346. Graduated from 0° to 50° C. by $\frac{1}{2}$ ° C. 3.25

11360. **REFRACTOMETER, Dipping, Bausch and Lomb.** This refractometer is particularly designed for the measurement of the refractive indices of dilutions, alcoholic and weak acid solutions. It finds frequent application in Food and Drug Laboratories, Breweries, Distilleries, Medical Laboratories, etc. In general it can be used for measuring indices of refraction of all fluids with indices from $n_D = 1.325$ to $n_D = 1.367$ with an accuracy of from $3\frac{1}{2}$ to 4 units in the fifth decimal place. The immersion method possesses two advantages. It permits, in the first place, the measurement of the refraction of light in a fluid in as simple a manner as taking its temperature with a thermometer or its specific gravity with a hydrometer; and second, the border line here appears much sharper than in other refractometers having the fluid enclosed between two prisms as in the Abbe refractometer. It allows, therefore, a much higher magnification in the telescope employed in the observation of the border line, and the accuracy of measurement is increased in a corresponding degree. The dipping refractometer excels in the accuracy of its readings all other refractometers for fluids and solid bodies, with the exception of the interference refractometers. The Dipping Refractometer is adjusted so as to give the normal value (15.0 scale divisions) for distilled water at 17.5° C. A metal beaker is provided to fit the prism end of the instrument tightly, fastening in place by means of a bayonet-lock, for use with volatile liquids such as ether solutions. When the auxiliary prism No. 11361 is used with the metal beaker, determinations can be made upon thin films of liquids, which are not available in quantity or are deeply colored. Complete with metal beaker, table for the conversion of scale divisions into refractive indices, table of readings for distilled water and directions for use, in polished hardwood case with lock and key 185.00

11361. **Auxiliary Prism**, for use with No. 11360, when only very small samples are available... 9.00
11365. **REFRACTOMETER, Dipping, Zeiss.** This instrument is the product of the original makers of this type of refractometer. It differs in no essential respect as to design or performance from No. 11360 and is preferred by some laboratory workers. Complete with metal beaker, table for the conversion of scale readings into refractive indices, table of readings for distilled water and directions for use, in wood case with lock and key..... 8.50
11366. **Auxiliary Prism**, for use with No. 11365..... 8.50
11367. **Heating Trough**, for use with Nos. 11360 and 11365, with glass plate in bottom, adjustable mirror, support for refractometer and shelf for 24 glass beakers. With 24 glass beakers, each with frosted square for marking.....each .12
11368. **Glass Beakers**, extra, for No. 11367, with frosted square for marking.....each .12
11369. **Thermometer**, for No. 11367, with red line at 17.5° C. Graduated from 15° to 20° C. by $\frac{1}{5}$ ° C. divisions 6.00

Prices on Nos. 11360, 11361, 11367, 11368 and 11369 subject to 10 per cent. discount to hospitals and educational institutions.



No. 11392.

11392. REFRACTOMETER, Pulfrich-Zeiss. This type of refractometer has a greater scope of application than the Abbe type, for with it almost all quantitative investigations on refraction and dispersion may be made. Among these uses may be mentioned the following: measurements of refraction of any spectral line to one unit in the fourth decimal place and dispersion (difference of indices for the Fraunhofer lines C, D, F, and G) to two units in the fifth decimal place, in transparent fluid or solid bodies either single or double refracting; investigations of fluids at high temperatures, including bodies that are fluid only under such conditions; determination of differences of refractive or dispersive power of such fluid or solid substances as differ but little in their optical properties, the instrument being used as a differential refractometer in this case.

In the construction of the parts, special attention has been given to securing simplicity in the methods of observing and in the subsequent computations. All parts of the apparatus are permanently fixed in position after being properly adjusted, making it available for instant use without previous adjusting. The computations for dispersion and other differential quantities are performed by means of tables without the use of logarithms.

A special feature of this instrument is the very efficient temperature control, obtained by completely water jacketing the prism with the exception of the vertical face from which the light emerges and the small rectangular aperture through which the light enters. The temperature is maintained by circulating water, at the desired temperature, through this water jacket and a specially provided silver heating device, in which a thermometer is mounted and which dips into the liquid under investigation in the glass cell mounted on the horizontal glass face of the prism. A wooden cover is supplied to reduce the radiation of heat.

The illumination is produced either by a sodium flame or by passing a high tension current through the hydrogen filled vacuum tube. Rapid change may be made from one to another by slightly deflecting a reflecting prism having a condensing lens cemented on one side to focus the beam on the prism. A clamp is provided for holding the vacuum tube and an additional condensing lens is mounted between it and the reflecting prism to concentrate the beam of light.

The observation of the angle of emergence of the light beam is made by a telescope attached to a divided circle provided with a vernier which enables the observer to read to 1 minute of arc. A clamp and micrometer screw with a drum head divided to 6 seconds of arc are provided for use in making dispersion measurements. A small prism on the eyepiece of the telescope permits the rapid location of the zero reading of the circle. A stop with elliptical aperture intercepts stray light from the prism.

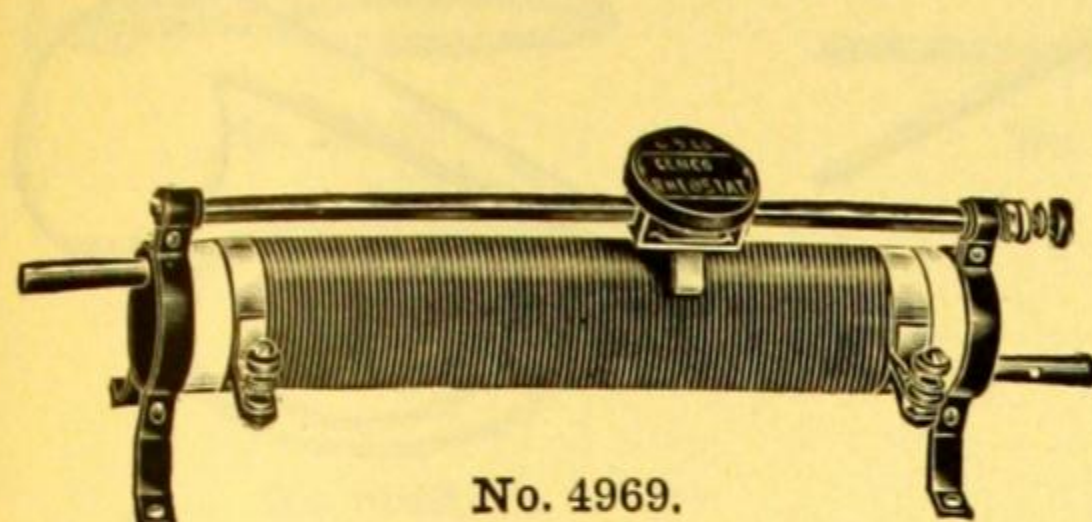
When used for solids, the specimen to be investigated must have two perpendicular faces meeting in an unbroken line; the one coming in contact with the prism must be plane and well polished. Optical contact is made with the prism by means of a drop of liquid of higher refractive index than that of the solid to be investigated. Monobrom naphthalene is usually used for this purpose.

Complete with heating device, hydrogen filled vacuum tube, prism of refractive index (n_D) of 1.75 for substances of refractive indices (n_D) between 1.47 and 1.74 with mount and carrier, thermometer with threaded adapter, bottle of monobrom naphthalene, conversion tables and directions for use, in hardwood case with lock and key.....\$420.50

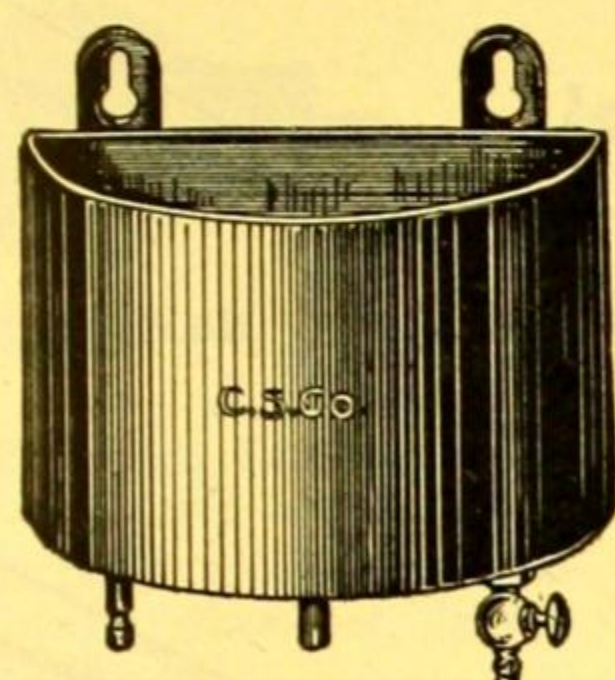
11393. Prism of refractive index (n_D) of 1.62 for examination of fluids having refractive indices (n_D) of 1.33 to 1.61, with mount, carrier and glass cell for liquids..... 36.00

11394. Thermometer with threaded adapter for No. 11392. Scale engraved on stem from 0° to 75° C. by 1° C. divisions..... 3.25

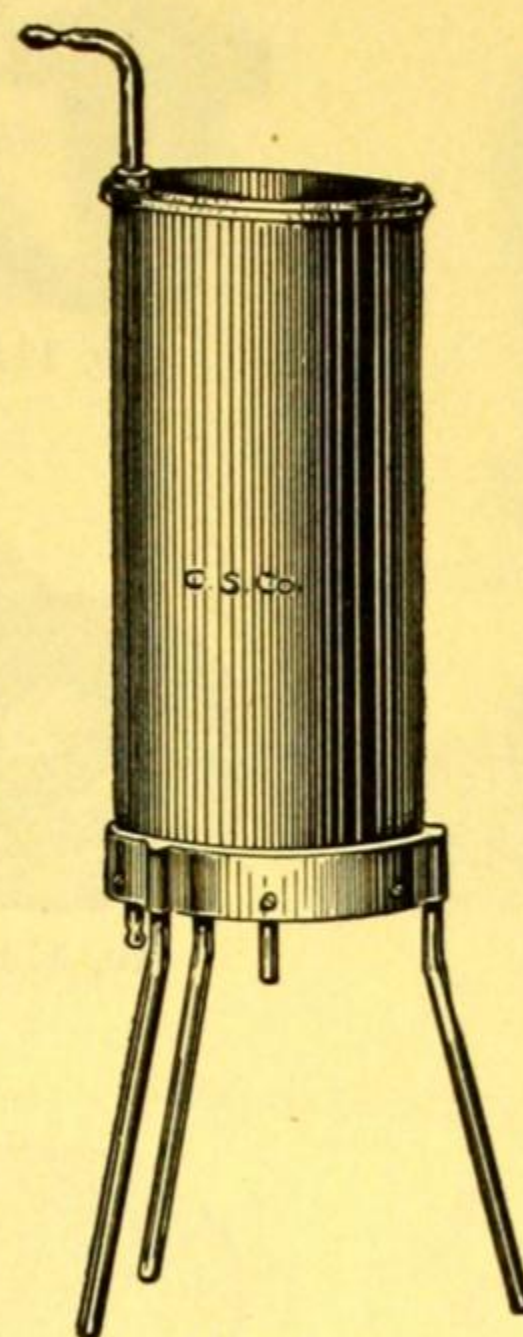
11395. Vacuum Tube, hydrogen filled, designed for use with No. 11392..... 5.75



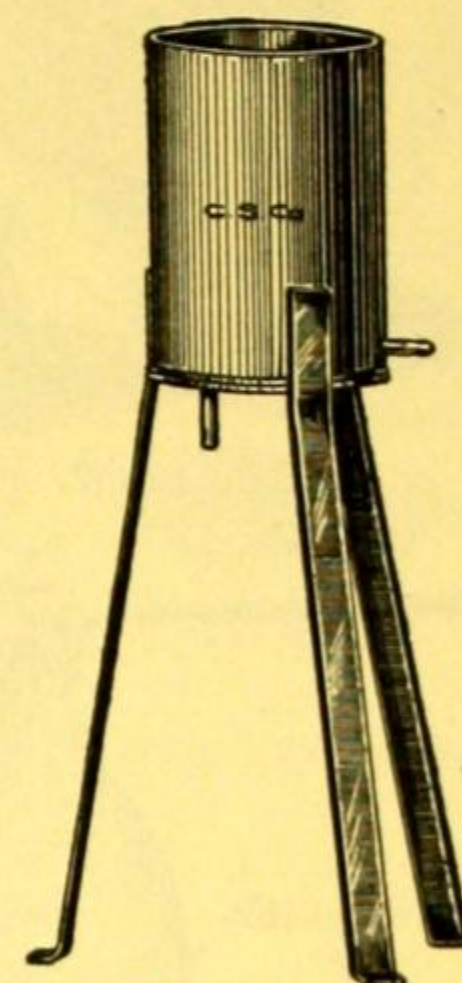
No. 4969.



No. 11413.



No. 11412.



No. 11414.

11406. "TABLES OF REFRACTIVE INDICES, VOLUME I, Essential Oils."

A compilation of the measurements of refractive indices, found scattered through the scientific literature, to assist the technical chemist in applying the Abbe refractometer to industrial work. This volume lists over 500 distinct oils and 1500 measurements, with a complete bibliography on the subject. \$6.75

11407. "TABLES OF REFRACTIVE INDICES, VOLUME II, Oils, Fats and Waxes."

This subject, including hardened oils, polymerized and blown oils, as well as some of the allied substances of interest to oil chemists, is treated in the same manner as No. 11376. It concludes with a bibliography. 6.75

11408. "TABLES OF REFRACTORY INDICES, VOLUME III, Sugar Tables."

A comprehensive compilation of tables relative to the sugar industry. (In preparation).

WATER HEATING AND CIRCULATING APPARATUS FOR USE WITH REFRACTOMETERS

4969. **WATER HEATERS, Cenco Continuous Current Electric**, substantially constructed of white porcelain enameled steel tubing with welded ends and water connections, coated inside with a protecting layer of the same porcelain enamel as on the outside to guard against rusting. They are approximately 12 inches long, wound with an oxidized wire of negligible temperature coefficient and provided with a sliding contact for the adjustment of the rate of heating. By adjusting the rate of flow of the water and the number of turns of heating wire by means of the slider, a wide range of temperatures may be obtained which are maintained remarkably constant, provided the voltage of the line does not vary materially.

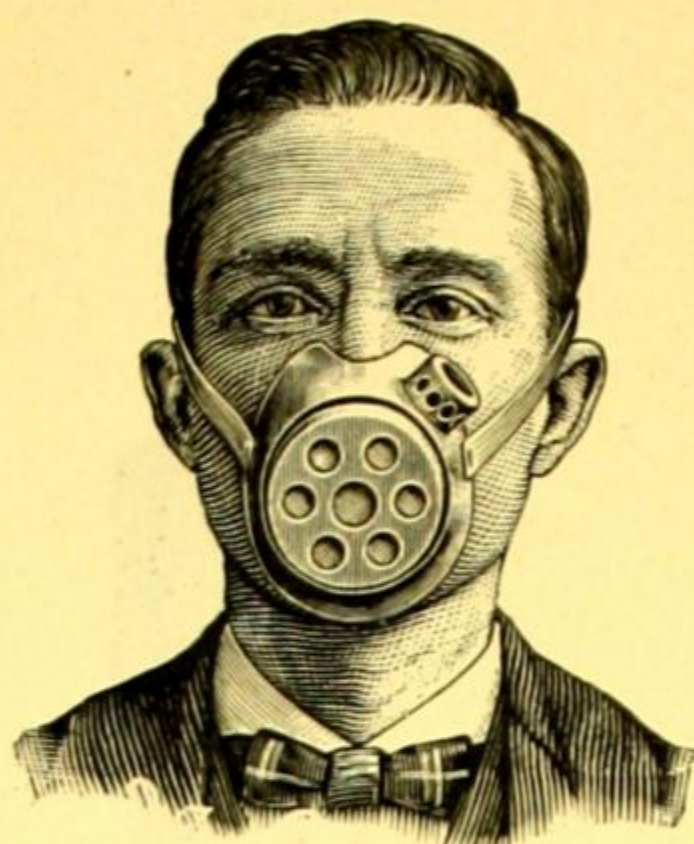
	A	B
No.	220	110
For volts	9.00	9.25
Each		

11412. **Spiral Heater**, consisting of a spiral of copper tubing between two telescoping copper cylinders. Tubulations for rubber tubing connections and a special tripod are provided. **Without burner** 45.00

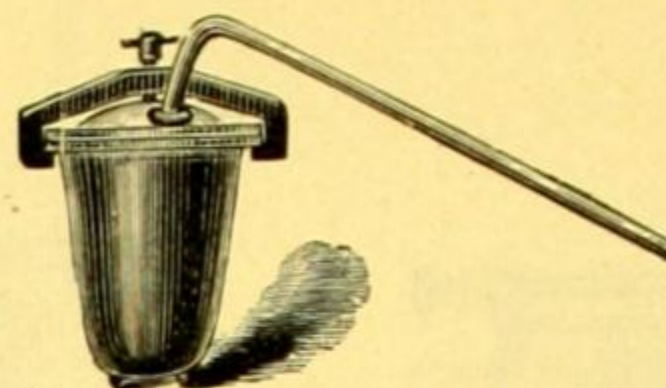
11413. **Water Pressure Tank**, wall form, used in connection with No. 11412 to maintain a constant pressure and flow of heated water to the refractometer by gravity. 5.00

11414. **Water Pressure Tank**, mounted on legs for table use, required with Nos. 11412 and 11413 only for use with the Abbe refractometer. 4.00

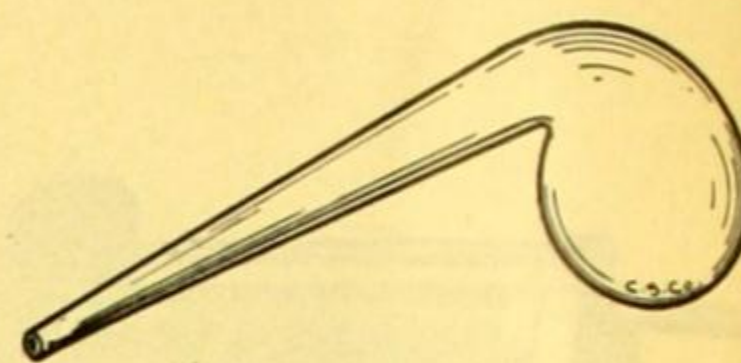
Prices on Nos. 11412, 11413 and 11414 subject to 10 per cent. discount to hospitals and educational institutions.



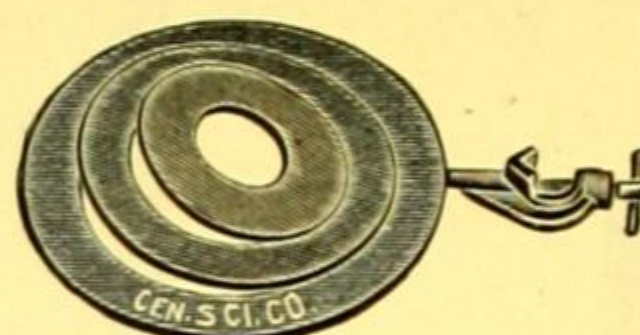
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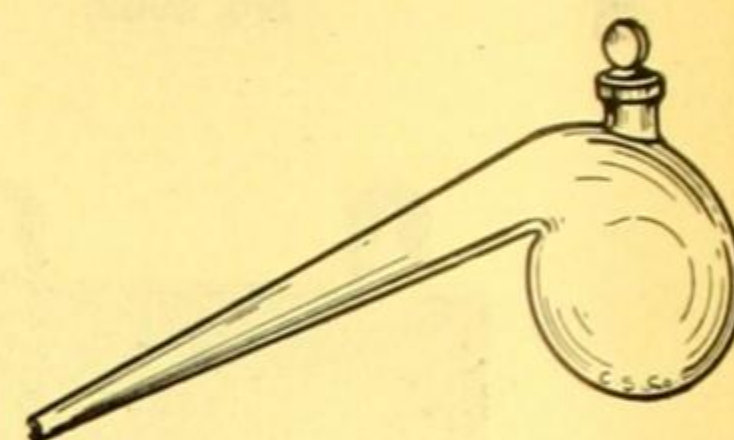
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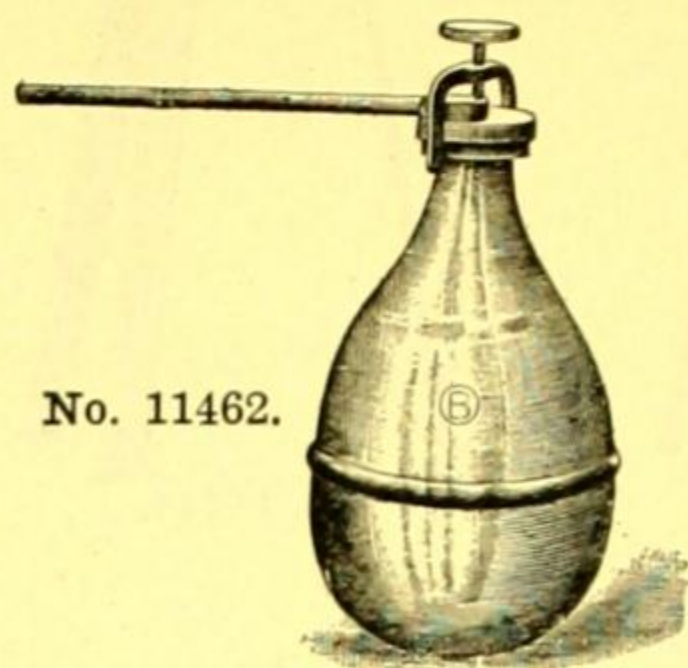
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No. 11494.



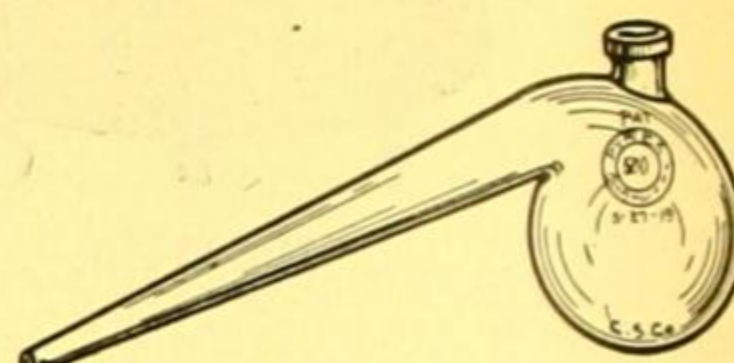
No. 11472.



No. 11462.



No. 11498.



No. 11474.

REGULATORS, Gas and Electrical, see Thermo-regulators.

REGULATORS, Gas Pressure, see Nos. 6530, 6552 and 7076.

RESERVOIRS, Leveling, see Bulbs, Leveling, No. 1902.

11450. RESPIRATOR, for protection from dust, sawdust, smoke, fumes and gases. Made of soft rubber and provided with a perfect filter device; easily kept clean and bends perfectly to fit the face \$1.70

RETORT ADAPTERS, see Adapters.

RETORT RECEIVERS, see Receivers.

11462. RETORTS, Copper, for making oxygen; flask shape, with iron clamp and brass delivery tube fitted with ground joint.

Capacity, cc.....	250	500	1000
Each	3.00	3.50	4.25

RETORTS, Copper for distillation, see Distilling Apparatus.

11468. RETORTS, Glass, plain.

Capacity, cc.....	125	250	500	1000
Each	.25	.30	.45	.65

11472. RETORTS, Glass, tubulated, with ground glass stoppers.

Capacity, cc.....	125	250	500	1000
Each	.70	.95	1.10	1.35

11474. RETORTS, Pyrex Glass, tubulated, but without glass stopper.

Capacity, cc	125	250	500
Each	1.60	2.00	3.00

11478. RETORTS, Iron, for distilling mercury, etc.; with removable cover, fastened by screw clamp, with delivery tube ground in the cover.

Capacity, cc.....	250	500	1000	2000
Each	3.60	4.00	4.40	5.50

RETORT, Iron, Skidmores, see No. 3440.

REVOLUTION COUNTERS, see Speed Counters.

RHEOSTATS, see Electrical Instruments.

11492. RINGS, Concentric, Copper, tinned inside, for water baths, with cover.

Number of rings in set.....	3	4	5	6
Outside diameter of largest ring, inches.....	3 $\frac{7}{8}$	4 $\frac{7}{8}$	5 $\frac{7}{8}$	6 $\frac{3}{4}$
Per set	.70	.90	1.10	1.20

11494. RINGS, Concentric, Iron, with two removable rings, with heavy screw for clamping on support for supporting water baths, sand baths, flasks, etc. Diameter of outside ring, 6 inches.. .75

11498. RINGS, Concentric, Porcelain, with cover.

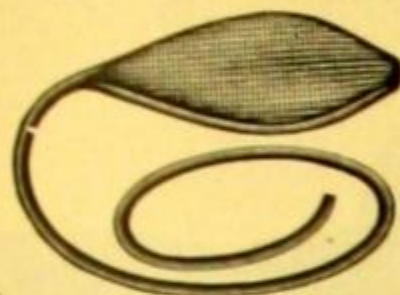
Number of rings in set.....	5	8
Outside diameter of largest ring, cm.....	15.5	20.8
Per set.....	2.90	4.95



No. 11502.



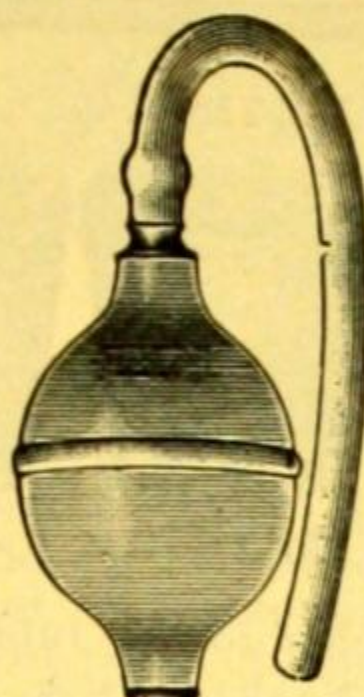
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No. 6645.



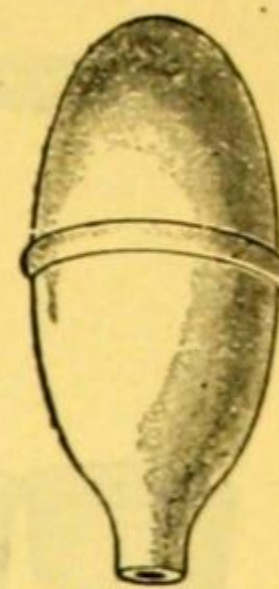
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No. 11530.



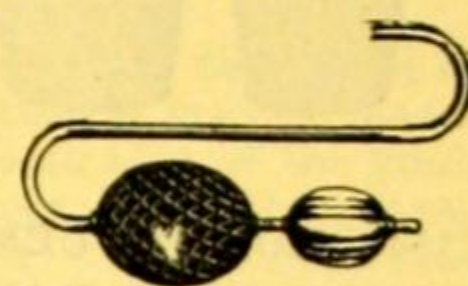
No. 11524.



No. 11526.



No. 11536.



No. 1382.

11502. **RINGS, Iron**, for attaching to retort stands; with $\frac{5}{16}$ inch screw. Distance from rod to center of rings, $4\frac{1}{2}$ inches.

Outside diameter, inches.....	2	3	4	5	6	7
Inside diameter, inches.....	$1\frac{5}{16}$	$2\frac{5}{16}$	$3\frac{3}{8}$	$4\frac{5}{16}$	$5\frac{1}{4}$	6
Each	\$0.16	.18	.20	.25	.30	.40

11504. **RINGS, Iron, Extension**, for fastening to retort stand by means of Clamp Holders Nos. 2914 and 2916. Length of rod, $7\frac{1}{2}$ inches.

Outside diameter, inches.....	3	4	5	6	7
Each	.15	.17	.20	.25	.30

RINGS, Suberite, see **Cork Rings** No. 3296.

RING STANDS, see **Supports**.

11512. **ROPE, Manila**, good quality, $\frac{3}{8}$ -inch diameter. (No order taken for less than 12 ft.) **Per foot** .04

RUBBER GOODS

RUBBER BAGS, see **Gas Bags** No. 6720.

11520. **RUBBER BANDS**, assorted, in $\frac{1}{4}$ pound boxes **Per box** .50

RUBBER BOTTLES, see **Bottles**.

11524. **RUBBER BULBS**, for dropping pipettes, medicine droppers, etc. Capacity, 2 cc. **Per doz.** .25
10% discount in lots of 144.

11526. **RUBBER BULBS**, large size, heavy walled, for pipettes, etc.

No.	A	B	C
Capacity, cc	5	25	50
Length, inches	$1\frac{1}{8}$	3	$3\frac{1}{2}$
Diameter, inches	$\frac{7}{8}$	$1\frac{1}{2}$	2
Each	.15	.20	.25

10% discount in lots of 12.

11530. **RUBBER BULB**, with hard rubber valves, for pressure only, with connecting tube. Capacity, about 50 cc **Per doz.** .40
10% discount in lots of 12.

RUBBER BULB EXPANDER, see No. 11630.

6645. **RUBBER BULB**, of pure gum, with flexible tube for use with gas analysis apparatus... .75

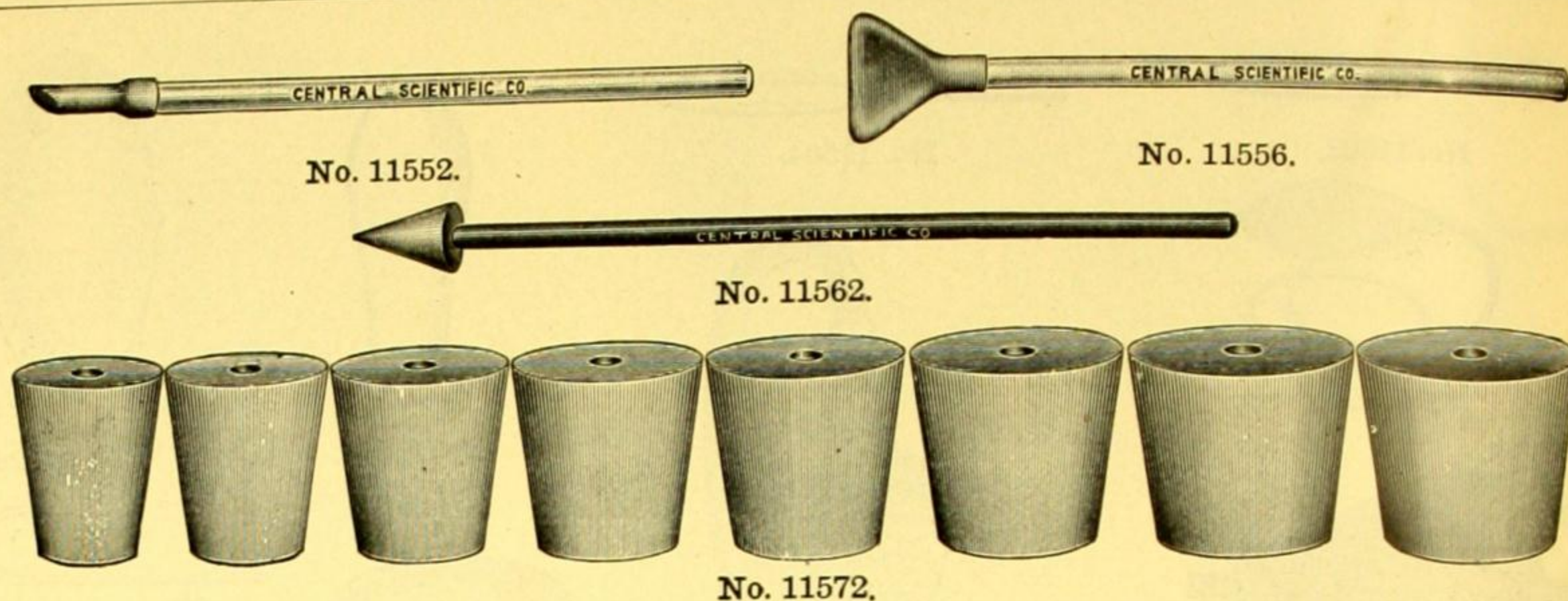
6832. **RUBBER BULB**, with double valves of hard rubber for use in sampling gas for analysis .55

1382. **RUBBER BULB**, with two bulbs, one covered with net for constant pressure. Can be used as a hand blower 1.70

11536. **RUBBER CAPS**, flat shape, for test tubes of same diameter as caps.

Diameter, inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Per dozen	1.20	1.20	1.20	1.20

10% discount in lots of 144.



11540. **RUBBER CEMENT**, for cementing rubber joints, rubber, etc.....Per ounce bottle \$0.15
11544. **RUBBER DAM**, pure gum. Thickness, No. 31 B. & S. gage; weight, approximately $\frac{3}{4}$ oz. to the square footPer square foot .20
11546. **RUBBER DAM**, pure gum, 36 inches wide. Thickness, No. 29 B. & S. gage; weight, approximately 8 oz. to the linear foot.....Per linear foot .60
- RUBBER DISKS** for Foot Bellows, see **Blowers**.
- RUBBER FINGER COTS**, see **Finger Cots**, Rubber No. 5515.
- RUBBER FUNNELS**, see **Funnels**.
- RUBBER GLOVES**, see **Gloves**.
11552. **RUBBER POLICEMEN**, narrow shape, for removing precipitates from walls of beakers, etc.; flat end, $\frac{1}{8} \times \frac{7}{16}$ inch. Complete with glass rod $6 \times \frac{3}{16}$ inches.....Per dozen .90
10% discount in lots of 144.
11553. **RUBBER POLICEMEN**. Same as No. 11552, but without glass rod.....Per dozen .50
10% discount in lots of 144.
11556. **RUBBER POLICEMEN**, wing shape, with rubber $1\frac{1}{8}$ inches wide at end. Complete with glass rod $6 \times \frac{3}{16}$ inches.....Per dozen 1.20
10% discount in lots of 144.
11557. **RUBBER POLICEMEN**. Same as No. 11556, but without glass rod.....Per dozen .80
10% discount in lots of 144.
11562. **RUBBER SCRAPER** for scraping precipitates from the walls of beakers, etc. Hard rubber handle with soft cone shaped rubber tip..... .25
11566. **RUBBER SHEETING**, white, 36 inches widePer yard 1.00
- RUBBER SPATULAS**, see **Spatulas**.
- RUBBER STOPPERS**, made from best quality of rubber especially for chemical laboratory use; will not harden from age. Each size furnished in three styles—solid, one hole or two holes.
- 11572A. Rubber Stoppers, Solid.....Per pound 1.50
- 11572B. Rubber Stoppers, One Hole.....Per pound 1.50
- 11572C. Rubber Stoppers, Two Hole.....Per pound 1.50
- 10% discount in lots of 10 lbs., 20% discount in lots of 25 lbs., 33 $\frac{1}{3}$ % discount in lots of 50 lbs.
11573. **RUBBER STOPPERS**, same as No. 11572, but in assorted lots containing the common sizes used in chemical laboratories.

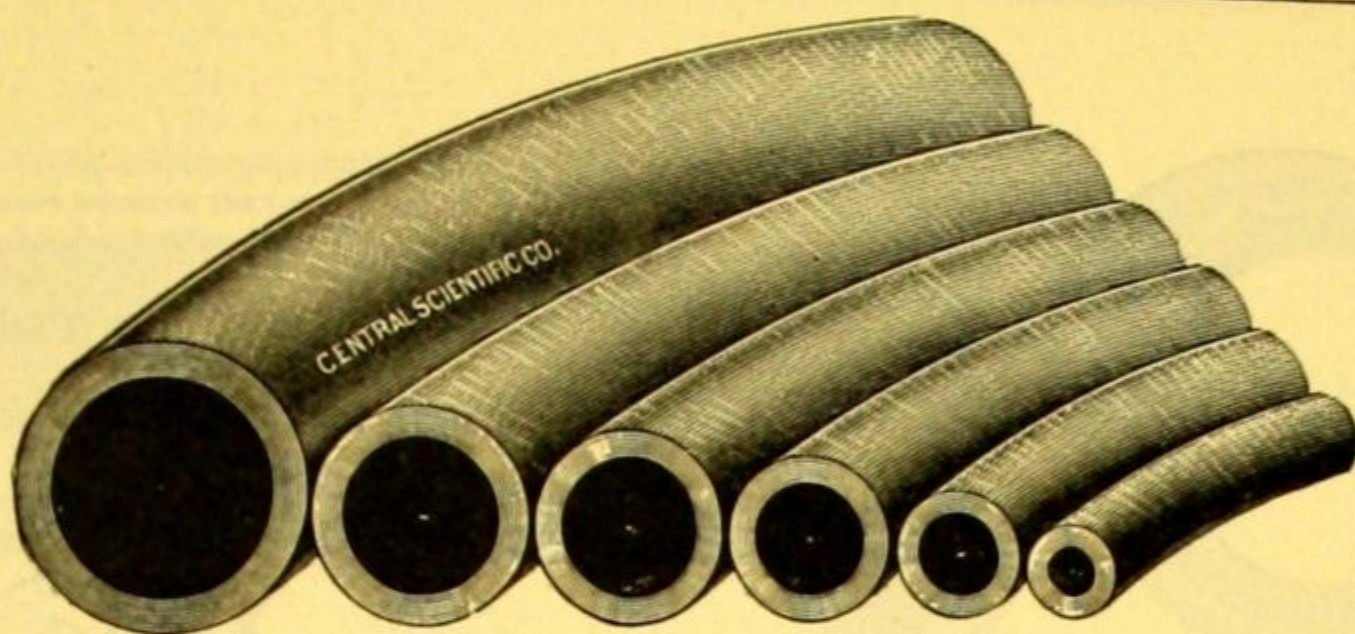
No.	A	B
Size of bag, pounds.....	1	2
Assorted sizes in bag.....	Nos. 2 to 6	Nos. 00 to 8
Per bag	1.50	3.00

Table Showing Approximate Number of Rubber Stoppers in One Pound.

Number	00	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Diameter large end, mm.....	14	17	18	20	23	25	27	32	37	41	45	50	56	63	68
Diameter small end, mm.....	9	12	15	16	18	20	23	26	30	33	37	42	48	53	61
Approximate Number in One Pound {															
Solid	120	80	60	55	42	33	28	20	15	12	11	8	6	5	4
1 hole	130	90	65	60	45	35	30	21	16	13	11	8	6	5	4
2 hole	138	94	70	64	47	38	32	22	17	14	12	8	6	5	4
Approx. weight per Doz., oz....	1.5	2.5	3.5	3.75	5	6	7	10	13	16	19	25	35	46	52

7372. **RUBBER STOPPERS**, especially designed for use with Moisture Testers Nos. 7360 to 7364, to stand the high temperature existing in moisture test flasks; they are necessary when copper flasks are used.

No.	5	6
Per dozen	1.50	2.00



RUBBER TUBING, ALL KINDS

Caution:—We recommend that the customer buy rubber tubing by the foot instead of by the pound on account of the fact that rubber tubing of various qualities from good pure gum to heavily loaded stock varies as much as 50% in specific gravity. The price per pound conveys no idea of the grade of tubing unless the number of feet per pound are given. At the same price per pound the poorest grade of tubing actually costs the most per foot since it is most heavily loaded. On the other hand the price per foot is an actual index to the quality of the tubing since the price of any rubber goods depends upon the percentage of pure Para rubber in the stock.

Special Notice:—Rubber Tubing of the various kinds listed comes in original 12 foot lengths from the manufacturer, and is sold only in lengths of 3 feet or multiples of 3. This enables us to avoid the waste due to short pieces of unsalable lengths and permits us to sell the tubing to our customers at a reasonable price, without the necessity of a charge to cover the loss.

11580. **RUBBER TUBING, White, light wall, cloth impression.** This tubing is recommended for general laboratory use where an inexpensive tubing is desired.

Diameter inside, inches.....	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches.....	3/64	3/64	1/16	1/16	1/16	1/16
Per foot (see Special Notice).....	\$0.05	.06	.09	.10	.12	.20

20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11582. **RUBBER TUBING, White, heavy wall, same quality as No. 11580.** The 1/4 inch size is the standard size and quality for Bunsen burner connections.

Diameter inside, inches.....	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches.....	3/32	1/8	1/8	1/8	1/8
Per foot (see Special Notice).....	.10	.17	.20	.23	.30

20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11588. **RUBBER TUBING, Red, Antimony, light wall.** Retains its elasticity longer than No. 11580 and is preferred by many users for this reason.

Diameter inside, inches.....	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches.....	3/64	3/64	1/16	1/16	1/16	3/32
Per foot (see Special Notice).....	.05	.08	.10	.13	.15	.25

20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11590. **RUBBER TUBING, Red, Antimony, heavy wall, same quality as No. 11588.** Preferred by many users for Bunsen burner tubing in place of No. 11582.

Diameter inside, inches.....	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches.....	3/32	3/32	3/32	3/32	1/8
Per foot (see Special Notice).....	.13	.17	.23	.28	.35

20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11594. **RUBBER TUBING, Black, pure gum, light wall, seamless.** This tubing will not bloom and is especially suited for gas analysis work.

Diameter inside, inches.....	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches.....	1/32	3/64	1/16	1/16	1/16	3/32
Per foot (see Special Notice).....	.05	.08	.10	.13	.15	.30

20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11596. **RUBBER TUBING, Black, pure gum, heavy wall, same quality as No. 11594.**

Diameter inside, inches.....	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
Thickness of wall, inches.....	3/32	3/32	3/32	1/8	1/8	1/8	1/8	1/8
Per foot (see Special Notice).....	.15	.17	.23	.28	.35	.50	.60	.70

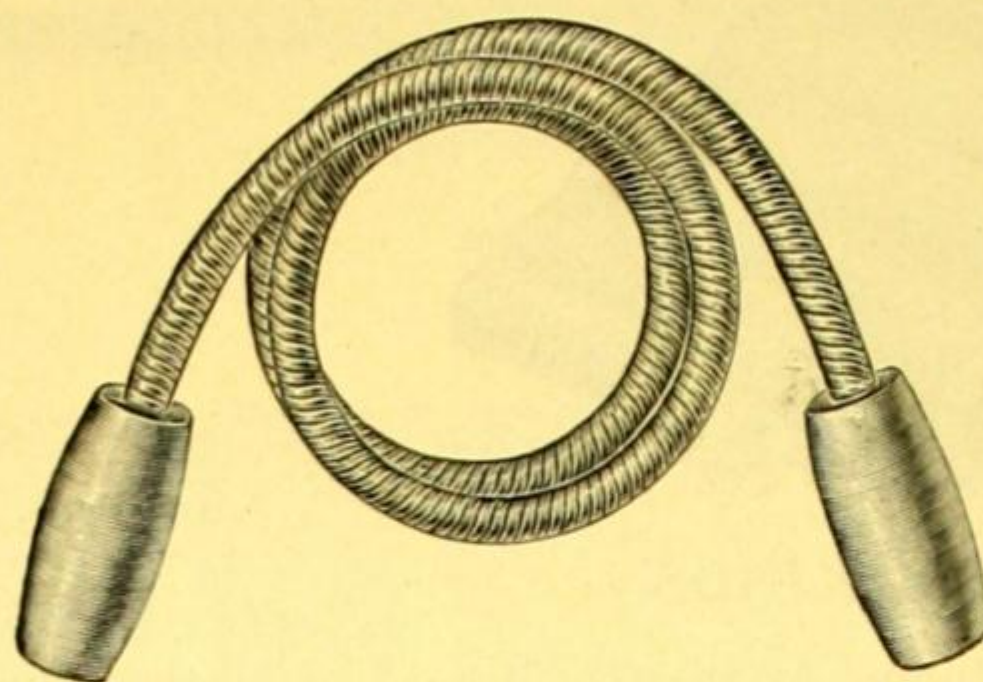
20% discount in lengths of 12 feet, 33 1/3% discount in boxes containing 96 feet.

11610. **RUBBER TUBING, Red, semi-pure gum, extra heavy wall, for filter and air pump connections, mercury leveling bulbs, nitrometers, high vacuum work, etc.** The selection of this tubing is the result of years of experience with high vacuum apparatus in our factory and engineering laboratories, and is not to be confused with other vacuum tubing sold under the same name. Since this tubing has been selected solely because of its superiority, it is not marketed on a price basis.

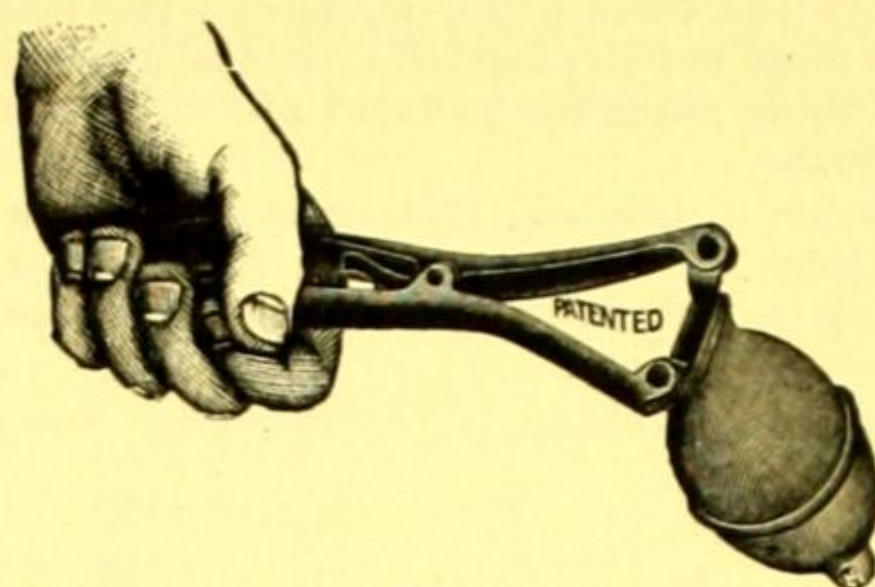
Diameter inside, inches.....	1/8	3/16	1/4
Thickness of wall, inches.....	3/32	3/16	3/16
Per foot (see Special Notice).....	.25	.35	.40

11614. **RUBBER TUBING, Pressure, cloth insertion, heavy wall, for air pump connections, etc.**

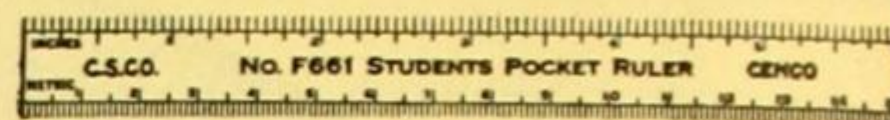
Diameter inside, inches.....	3/16	1/4	5/16	3/8	1/2
Per foot (see Special Notice).....	.14	.15	.17	.20	.25



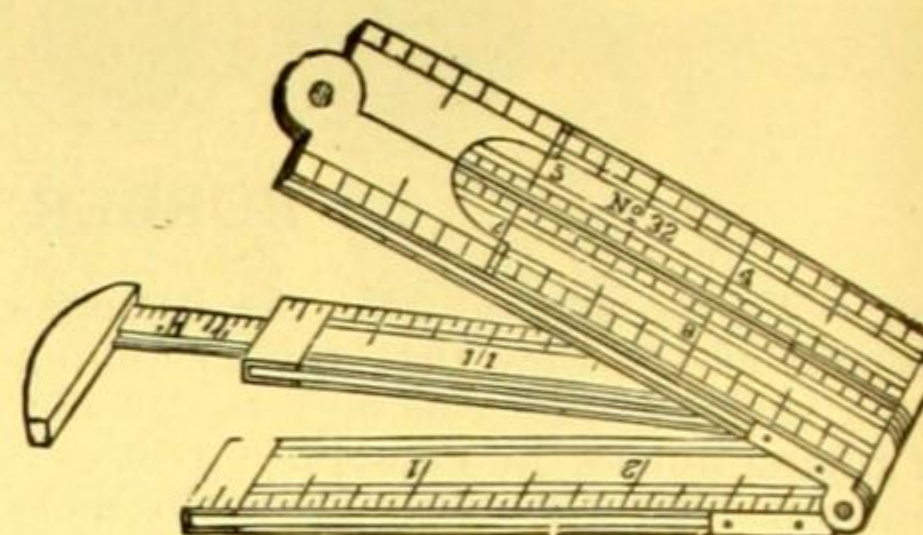
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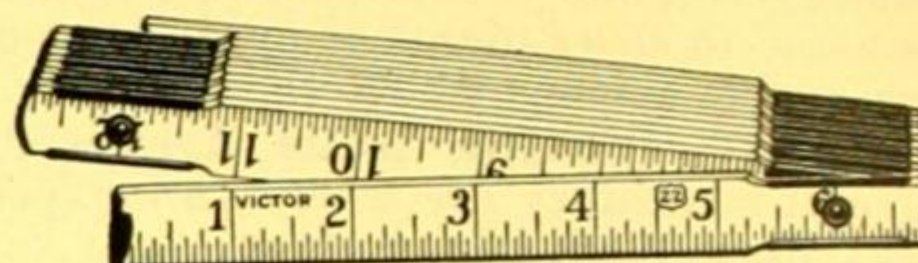
No. 11630.



No. F661.



No. 11640.



No. 11642.

11618. **RUBBER TUBING** for Gooch Crucibles, thin walled band tubing, pure gum, very elastic.

No.	A	B	C
Diameter inside, open, inches.....	1	1 1/4	1 1/2
For Gooch crucible, No.....	2	3	4
Width outside, flat, inches.....	1 1/2	1 3/4	2 1/8
Per foot	\$0.18	.24	.28

20% discount in lots of 12 feet.

11624. **TUBING, Flexible, Steel**, with rubber packing, for connections to Bunsen burners, hot plates, etc. It is indestructible except by acids and excess of oil, is gas tight and safe from kinking or breaking. Each length is furnished with heavy rubber socket at each end. Inside diameter, 1/4 inch.

Length, inches	24	36
Each	.25	.35

11630. **RUBBER TUBE and Bulb Expander**, for stretching tubing and bulbs to facilitate attaching to connection tubes, pipettes, etc..... .60

F661. **RULE, Celluloid, English and Metric**, 6 inches long. Of white celluloid with one edge graduated in mm, other edge in eighths of inches. The two scales are numbered from the same end of the rule, making easy a comparison of measurements in the two systems. This scale may easily be carried in the vest pocket..... Each .10

Per hundred 8.00

11640. **RULE, English and Metric**, boxwood, 12 inches by 16ths on one side, millimeters on the other. Four fold, solid brass joints, with brass caliper extension for measuring diameters up to 2 3/4 inches or 70 mm. Made to carry in pocket90

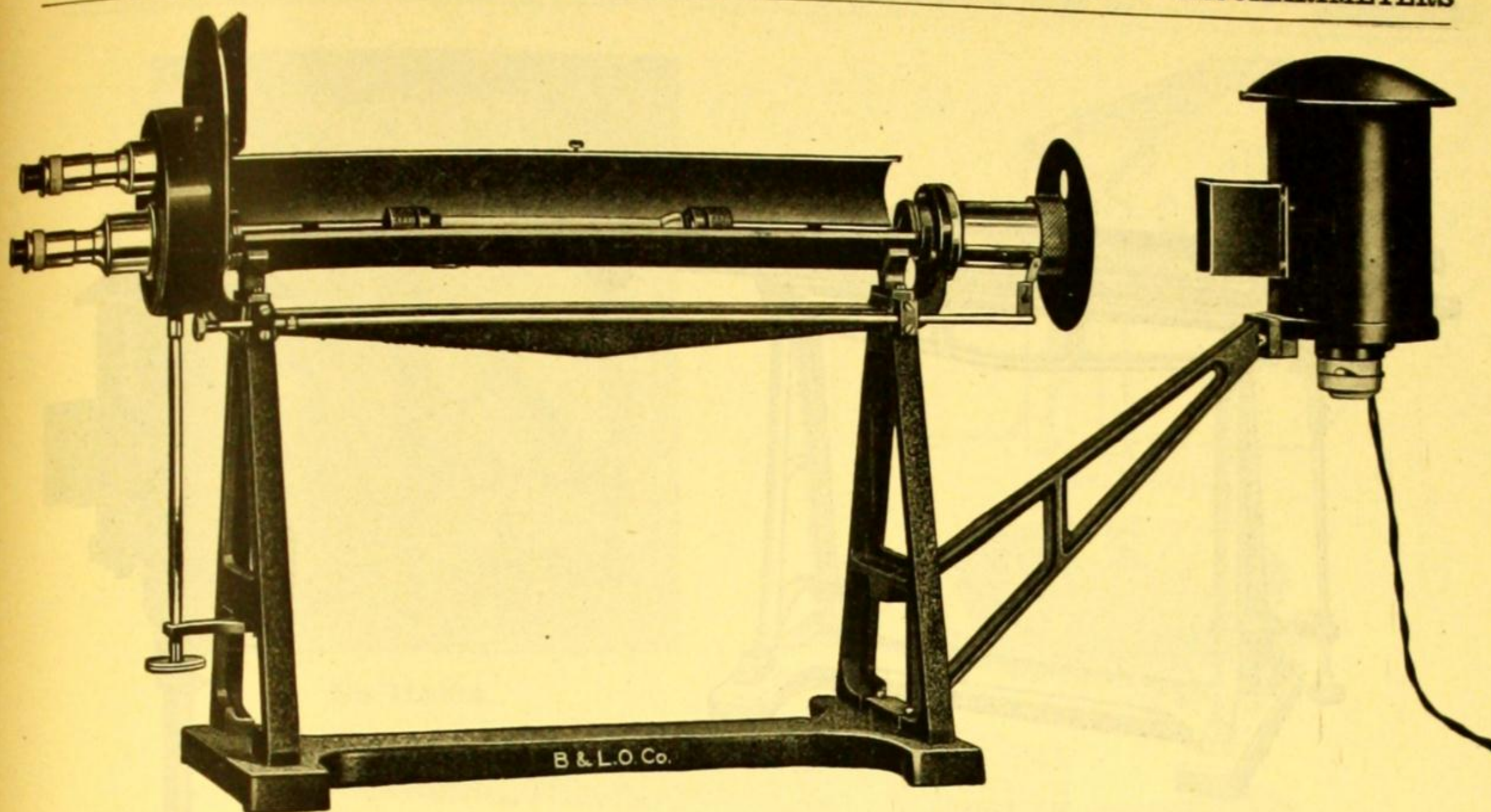
11642. **RULE, English and Metric**, light boxwood, 36 inches by 16ths on one side, millimeters on the other. Six fold, spring joints, very convenient for comparing English and metric measurements. Made to carry in pocket..... .30

RULES, Metric, see Scales.

RULE, Parallel, see Drawing Instruments.

RULES, Slide, see Slide Rules.

F845. **RUPERT'S DROPS** Per dozen .70



No. 11680.

11680. **SACCHARIMETER, Bausch & Lomb, Half-Shadow, with Lippich Polarizer.** The rotation of the plane of polarization, which takes place in the solution under investigation, is compensated in this instrument by the linear movement of a single quartz wedge, which movement is read from a scale etched on a frosted glass plate with overlapping vernier constructed in the same manner. The scale covers a range of from -30 sugar degrees to +110 sugar degrees and, from the construction of the vernier, fractions of tenths of a degree may be estimated to 0.025 sugar degree. The scale is so adjusted that 100 sugar degrees is equal to an angular rotation of 34.657° of arc, this being the optical rotation of a column 200 mm long of a solution of 26 grams of sucrose made up to 100 cc at 20° C. The entire scale and quartz wedge are enclosed in a metal protecting case, the scale readings being made by a reading microscope and the observations by a telescope. The standard I. S. C. Paris 1900 bichromate cell has been replaced by a permanent glass light filter of equivalent absorption and may be removed from the optical system by a push rod mounted on the front of the instrument. The light source consists of a 100 watt concentrated filament Mazda lamp, operating from the laboratory illuminating circuit, placed in a well ventilated lamp house mounted on a detachable bracket at the rear of the heavy trestle support. Illumination of the scale is obtained by means of two reflecting prisms in such a manner that the light is not cut off when a control tube or constant temperature tube is being used. Complete with lamp, lamp bracket, one each 100 mm, 200 mm, and 400 mm observation tubes, adjusting key, threaded tube for removal of polarizer and analyzer mounts, in case with lock and key.....\$525.00

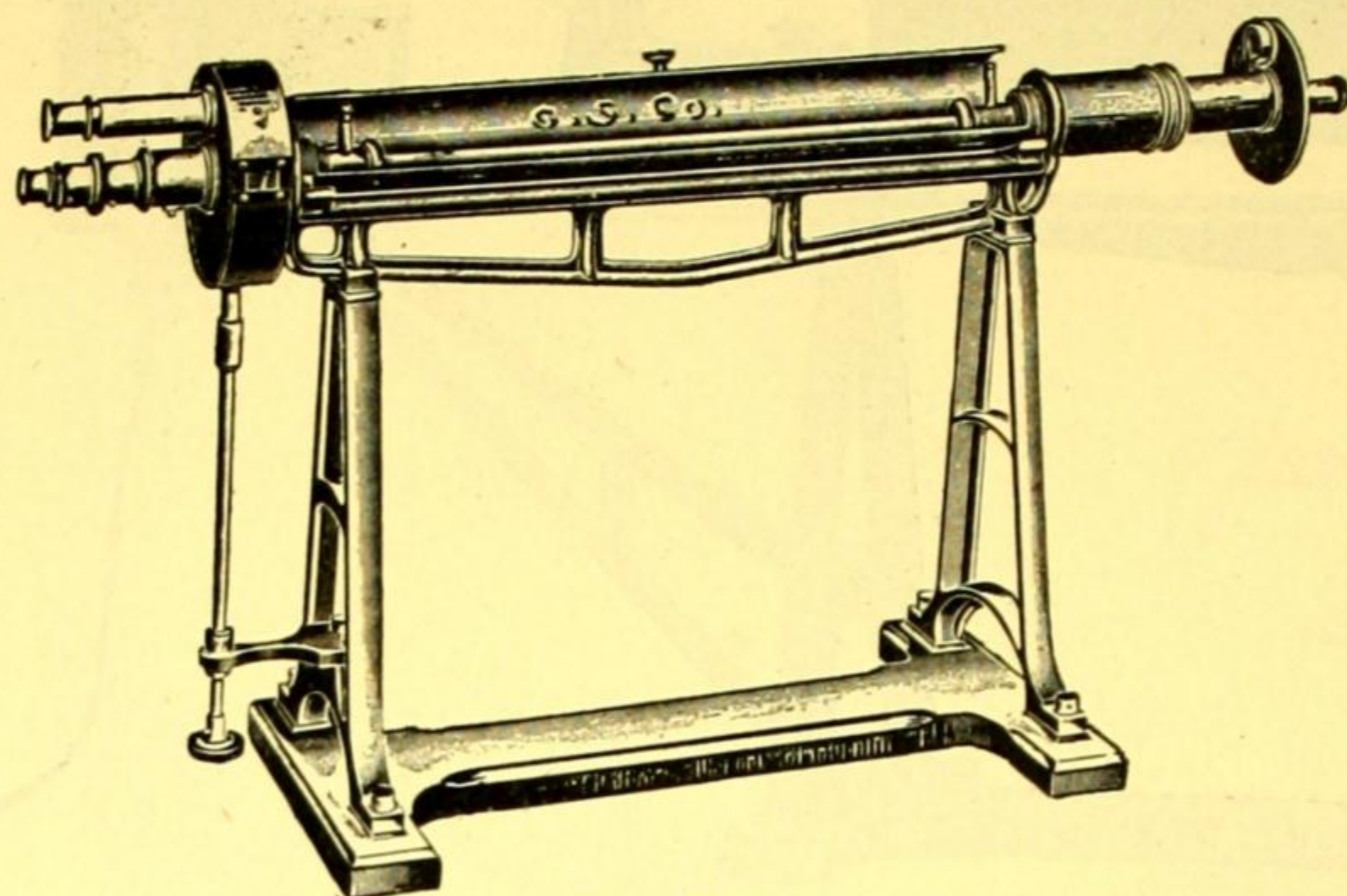
Note:—If Jellet type of Polarizer is desired instead of the Lippich type, it can be furnished at the same price on special order.

11688. **SACCHARIMETER, Schmidt and Haensch, Half-Shadow, with Lippich Polarizer.** The rotation of the plane of polarization is compensated in this instrument by a single quartz wedge as in No. 11680. The movement of the wedge, however, is read on an engraved German silver scale, illuminated by light reflected from appropriately placed mirrors, by means of a vernier and reading microscope. The scale is graduated from -25 sugar degrees to +100 sugar degrees. The adjustment of the scale is the same as in No. 11680, i. e. 34.657° of arc are equal 100 sugar degrees based on the 26 gram weight of sugar. The quartz wedge and scale are completely enclosed in a strong dust proof case on which the observation telescope and reading microscope are mounted. This instrument will take observation tubes up to 400 mm in length but reads directly only with the 200 mm tube. When the 400 mm tube is used all scale readings must be divided by two, and when the 100 mm tube is used they must be multiplied by two. This instrument, like all other saccharimeters, is made for use with white light only. A bichromate cell is provided as a light filter and is filled with a 6 per cent. solution of potassium bichromate when making ordinary observations. The stand is of the trestle design with a heavy cast iron base plate. Complete with one each 100 mm, 200 mm and 400 mm observation tubes but without light source. (For illustration, see next page.)..... 350.00

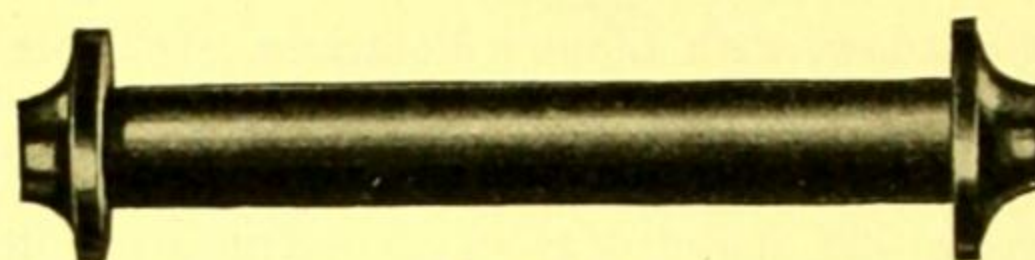
For Saccharimeters for Grape Sugar, see **Urine Analysis Apparatus.**

For Sugar Refractometers, see **Refractometers.**

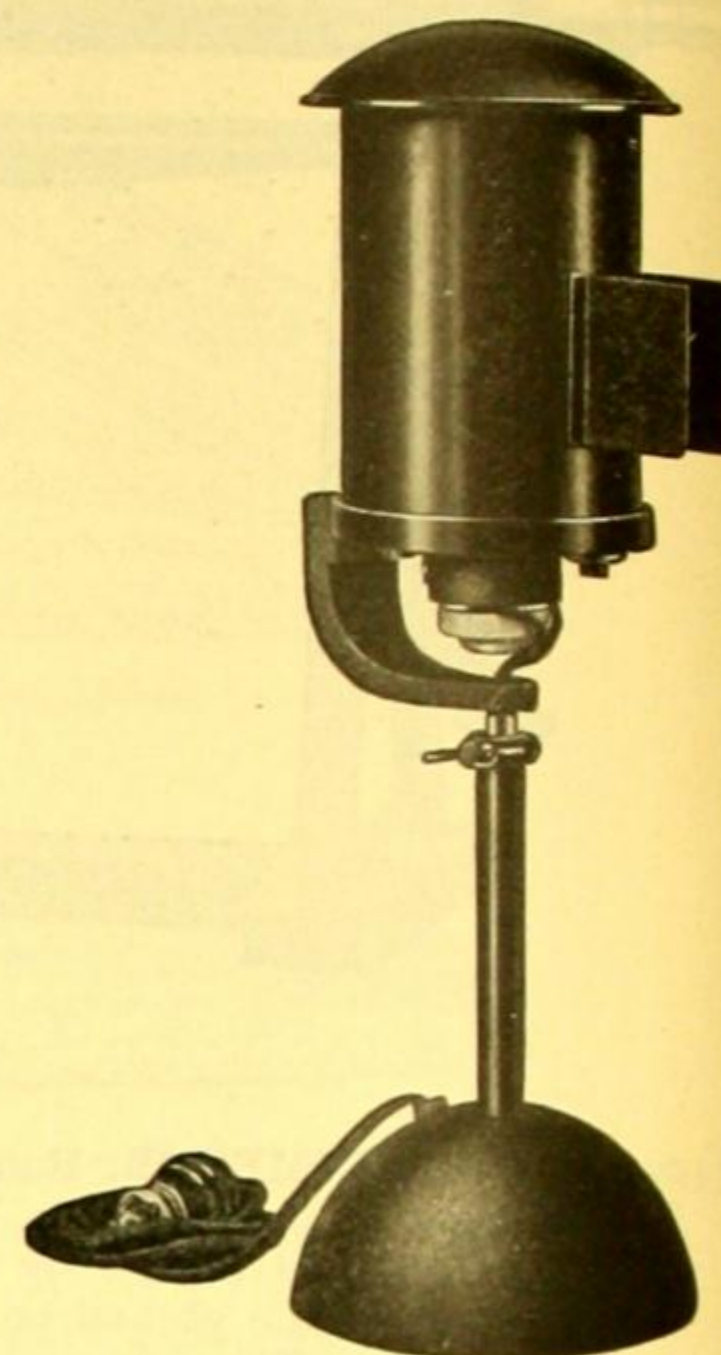
Price on No. 11680 subject to 10 per cent. discount to hospitals and educational institutions.



No. 11688.
(Described on preceding page.)



No. 11712.



No. 11700.

11700. **Saccharimeter Lamp, Electric**, for use with No. 11688. Similar in construction to the lamp which forms a part of saccharimeter No. 11680, except that it is mounted on a separate support. The bulb is a 100 watt Mazda, with concentrated filament, placed in a well ventilated lamp house with a hooded opening in the side containing a plate of ground glass, which becomes the light source. The support is adjustable for height, so that it may be used with any type of instrument, and provides for a mean height of filament of 340 mm. The metal base is unusually heavy to give the lamp the necessary stability. Complete with cord, switch and plug for use on a 110 volt circuit..... \$30.00

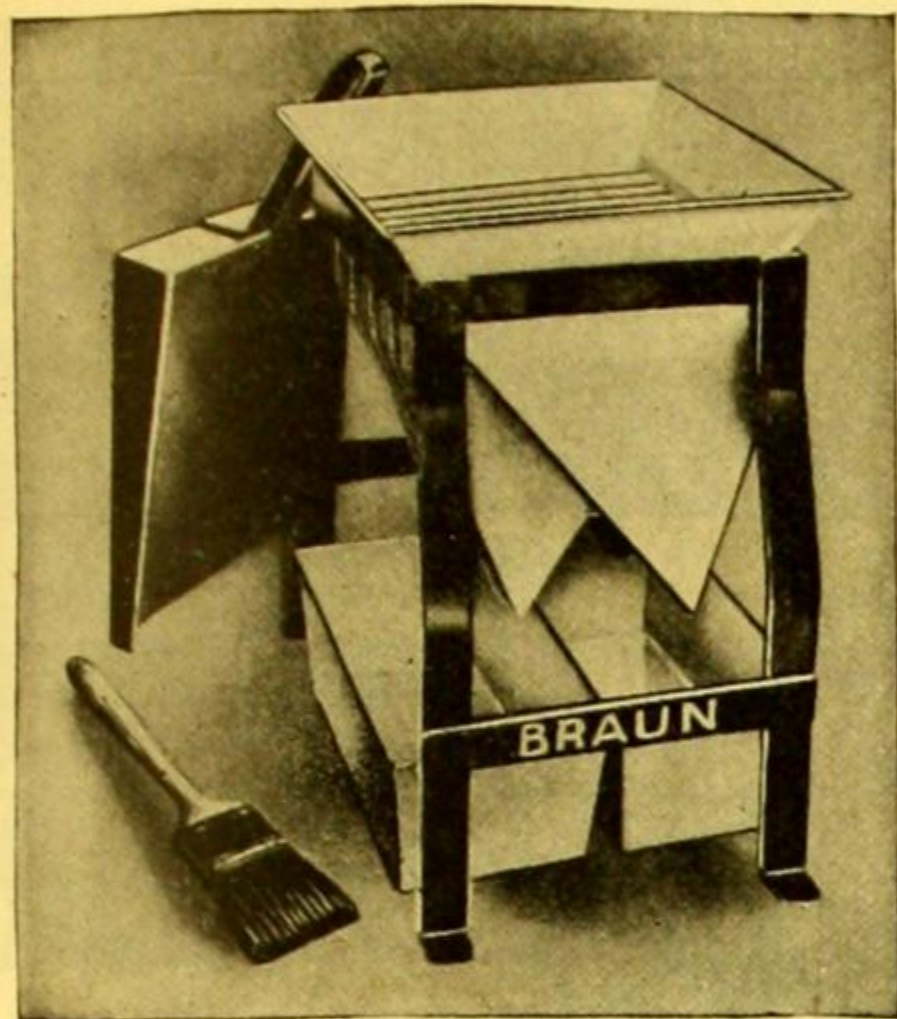
11701. **Electric Lamp Bulb, Frosted**, for replacement in No. 11700. For 110 volt circuits...each 2.00

11712. **Control Plates, Quartz**, for checking saccharimeter adjustments, mounted in a brass tube so that the plate is exactly at right angles to the optical axis of the saccharimeter. The adjustment is based on the factor 34.657° of arc equal 100 sugar degrees, the sugar degree being one hundredth part of the rotation shown by a column 200 mm long of a solution of 26 grams of sucrose made up to 100 cc at 20° C.

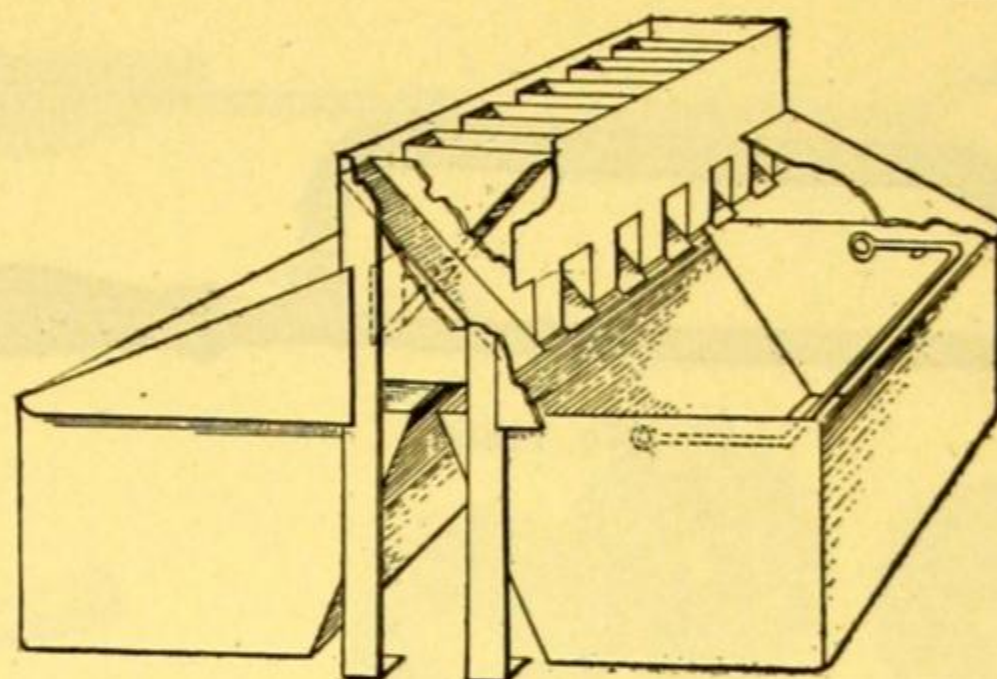
No.	A	B	C	D
Approximate reading in sugar degrees.....	25	50	80	100
Each	30.00	30.00	30.00	30.00

For Observation Tubes, Cover Glasses and Rubber Rings, see Nos. 10889 to 10891.

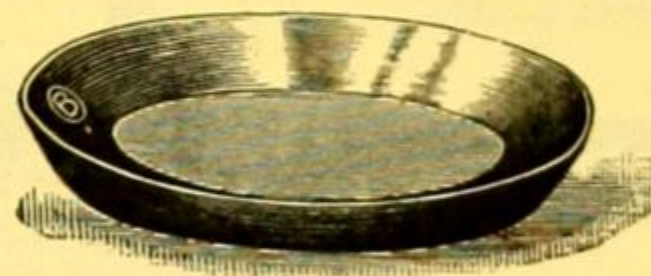
Prices on Nos. 11700, 11701 and 11712 subject to 10 per cent. discount to hospitals and educational institutions.



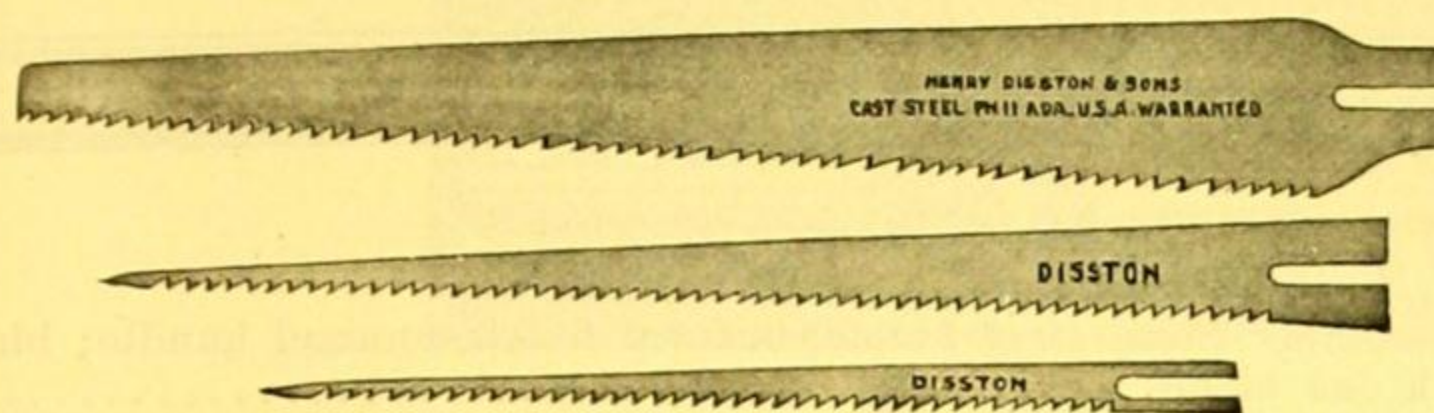
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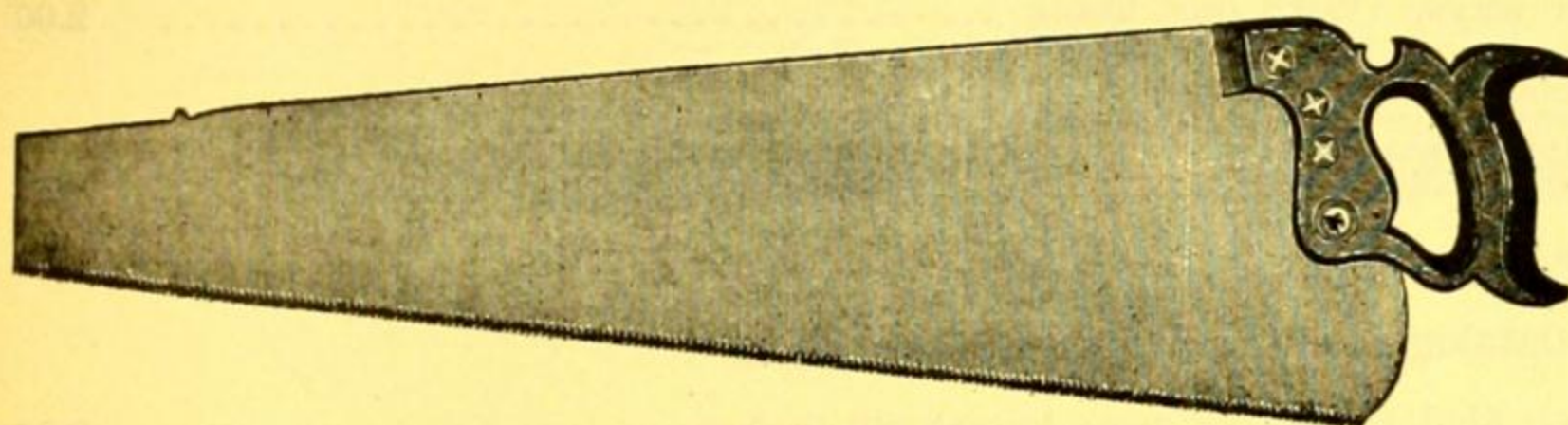
Nos. 11802-4.



No. 11830.



No. 11850.



No. 11852.



No. 11832.

SAMPLE BOTTLES, see Bottles.

SAMPLE BOXES, see Boxes.

SAMPLE JARS, see Jars.

11800A. **SAMPLER**, Jones, for quick and uniform sampling of ores, cement, coal, etc.; easily cleaned. Complete with hopper mounted on support, 4 sampling pans, brush and scoop.

No.	A
Size, inches	6x6
Width of troughs, inches.....	1/2
Number of troughs.....	8
Each	\$21.50

11802. **SAMPLER**, Riffle, for reducing quantity of 4-mesh coal samples, according to specifications of the United States Bureau of Mines and the American Society for Testing Materials. With twelve divisions, each 5/8-inch wide. Complete with four sampling pans, scoop and brush. (See Journal of Industrial and Engineering Chemistry, Vol. IX, No. 1, for January 1917.) 25.00

11804. **SAMPLER**, Riffle, for reducing the 20 and 60-mesh coal to a laboratory sample. Similar to No. 11802, but with twelve divisions each 3/8 inch wide. Complete with four sample pans, scoop and brush 25.00

SAND, see Sea Sand.

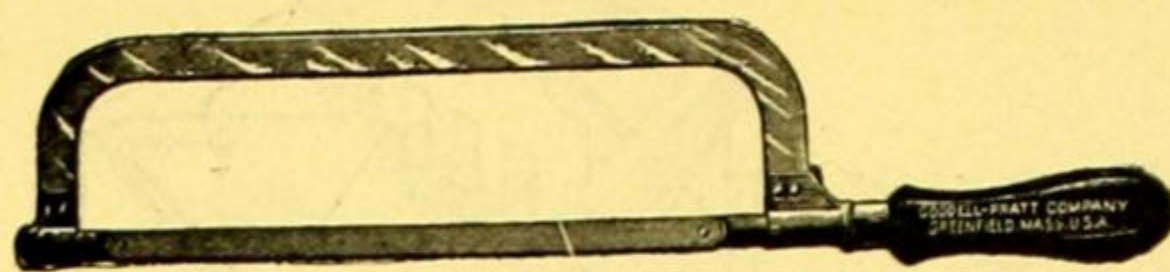
SAND, Standard for Cement, see Cement Testing Apparatus.

11830. SAND BATHS , cold rolled steel, shallow form.	3	4	5	6	8	10
Diameter, inches	.08	.10	.12	.20	.30	.50
Each						
11832. SAND BATHS , cold rolled steel, hemispherical form.	3	4	5	6	8	10
Diameter, inches	.10	.12	.20	.25	.40	.65
Each						

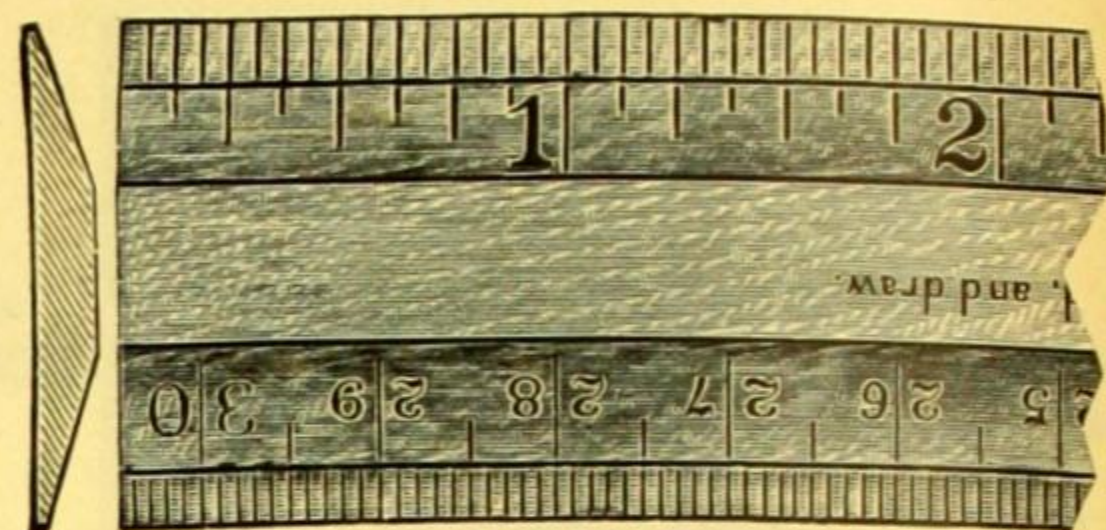
SAND PAPER, see Paper.

11850. **SAW**, Combination. Wood handle, with polished brass adjusting lever and set of three interchangeable blades, including a 10-inch keyhole blade and a 14-inch compass blade..... 2.00

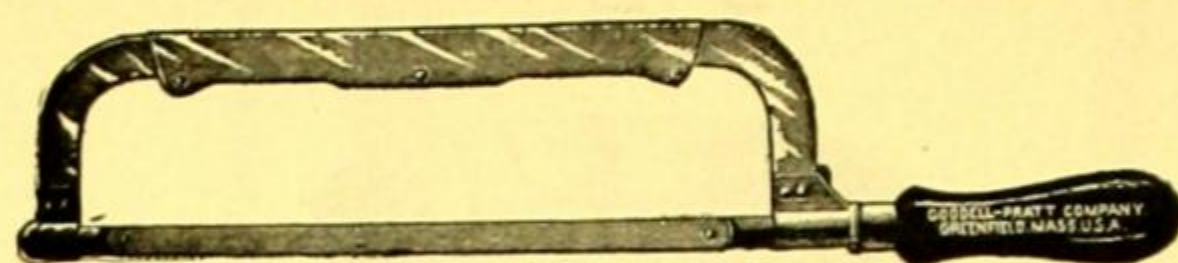
11852. **SAWS**, Crosscut, good grade steel, filed ready for use. Length, 26 inches..... 2.00



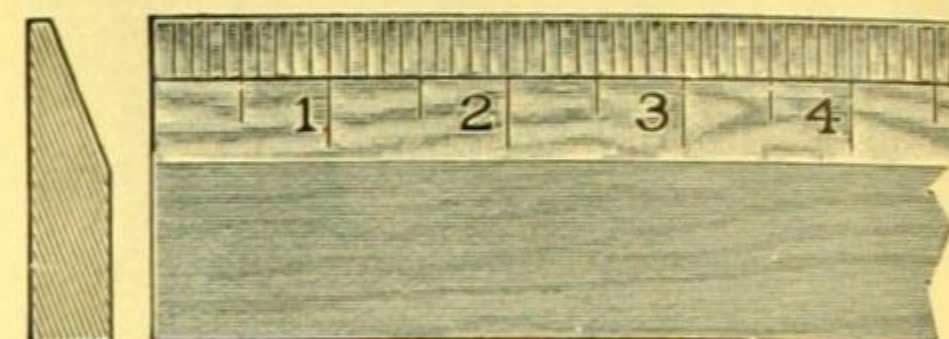
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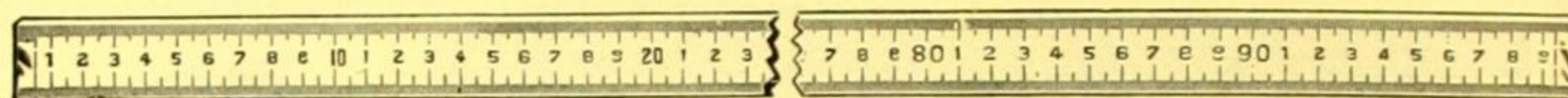
No. F727.



No. 11858.



No. F729.



No. 11882.

11856. **SAW, Hack**, for cutting metals. Solid steel frame, natural finish, enamel handle; blade can be faced four ways. With one blade..... \$1.00

11858. **SAW, Hack**, of steel, white nickel-plated, except the handle. Adjustable for 8 to 12-inch blades; blades can be faced four ways. With one blade 2.00

11859. **Saw Blades**, high grade steel, for hack saws.

Length, inches	8	12
Per dozen	.90	1.40

SAW, Keyhole, see No. 11850 Combination Saw.

SAWS, Pruning, send for Catalog A of Agricultural Apparatus.

11864. **SAW, Rip**, good grade steel, filed ready for use; length 28 inches..... 2.30

11870. **SCALE, Paper**, metric, printed on heavy bond paper, 3.5x23.5 cm; 20 cm along one edge is graduated in mm divisions.....

Per dozen .10

Per hundred .75

11871. **SCALE, Paper**, metric. 1 meter long, graduated in millimeters. For use vertically; zero at the top

Each .06

Per dozen .54

11872. **SCALE, Paper**, metric. Same as No. 11871, but with zero at the bottom.....

Each .10

Per dozen 1.00

11874. **SCALE (METER STICK)**, Maple, 2 cm square. One face is plain and shows the length of the simple meter; the second face is graduated in tenths of meters, or decimeters; the third face is graduated in hundredths of meters, or centimeters; and the fourth face is graduated in thousandths of meters, or millimeters. The last named face gives divisions also in decimeters and centimeters. This piece is valuable in teaching students the metric system of lengths. 1.30

11878. **SCALE (METER STICK)**, Boxwood. Graduated in millimeters and inches..... 1.00

11882. **SCALE (METER STICK)**, Maple. Both edges of one face are graduated in decimeters, centimeters and millimeters; one edge of the other face in inches and eighths..... .35

11892. **SCALE (DOUBLE-METER STICK)**, Maple, ends tipped with brass, two meters long.... 1.20

F727. **SCALE (RULE)**, Maple, metric and English, 12 inches long, one face graduated on one edge in millimeters and on the other in inches and 16ths. Double bevelled with protractor (5 degree divisions) on back.....

Each .06

Per dozen .60

F729. **SCALE (RULE)**, Boxwood, metric and English, 12 inches long. One edge bevelled and accurately graduated in millimeters, the other face graduated in inches and 16ths. Each .22

Per dozen 2.20

SCISSORS, see Shears.

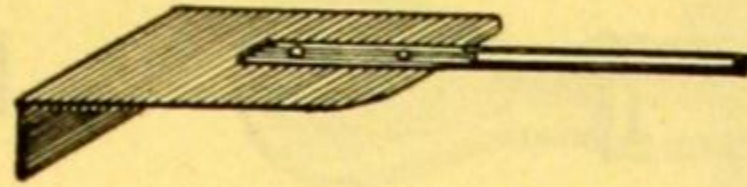
SCLEROSCOPE, see Hardness Testers.



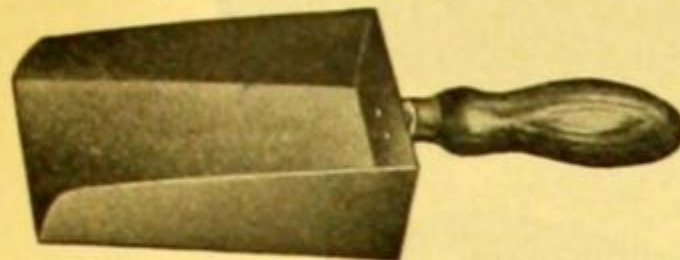
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No. 11908.



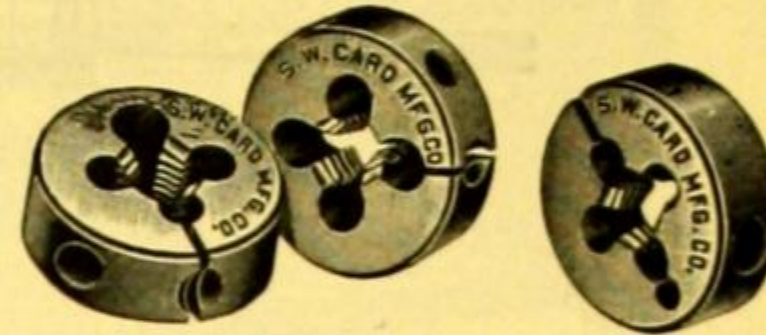
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No. 11916.



No. 11918.



No. 11960.

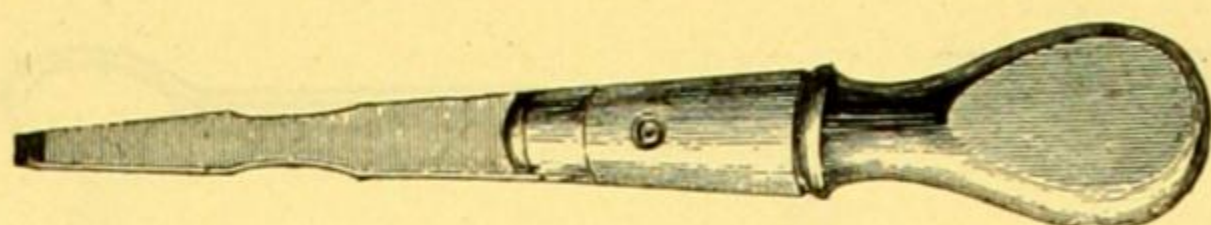


No. 11970.



No. 11961.

11904. **SCOOP, Agateware**, 3x5½ inches, with handle \$0.30
11908. **SCOOPS, Horn**, flat and wide, with square ends, for ordinary use.
- | | | | |
|------------|-----|-----|-----|
| Length, cm | 10 | 12 | 16 |
| Each | .25 | .30 | .45 |
11916. **SCOOP, Sampling**, of heavy iron with wood handle, 5x4½ inches..... 1.50
11918. **SCOOP, Tin plate**, with handle, for mixing. Length of bowl, 8 inches; width, 5½ inches .40
- SCOOPS, Weighing**, see **Balance Accessories**.
11932. **SCRAPER**, with end bent..... 1.50
11960. **SCREW DIES**, round, adjustable, ⅝ inch diameter, ¼ inch thick.
- | | | | | | | | | | |
|-----------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| No. | A | B | C | D | E | F | G | H | J |
| Screw gage No. | 2 | 4 | 6 | 6 | 8 | 8 | 10 | 12 | 14 |
| Approx. diam., inches | ⅝ | ⅞ | ⅞ | ⅞ | ⅞ | ⅞ | ⅞ | ⅞ | ⅞ |
| No. threads to inch | 56 | 36 | 32 | 40 | 32 | 40 | 32 | 24 | 20 |
| Each | 1.05 | .75 | .75 | .75 | .75 | .75 | .75 | .75 | .75 |
11961. **SCREW DIE STOCK**, for holding No. 11960 Dies80
11968. **SCREW DIE AND TAP SET**, with stock 7 inches long, tap wrench 7½ inches long, 6 dies 1⅜ inch diameter and 6 taps cutting threads 4-36, 6-32, 8-32, 10-24, 12-24 and 14-20. Set is enclosed in neat hardwood case..... 9.00
11970. **SCREW DIE AND TAP SET**, with stock 9 inches long, 5 dies 1 inch in diameter, and 5 taps cutting threads ¼-20, ⅝-18, ⅜-16, ⅞-14 and ½-12. Set is enclosed in neat hardwood case 9.00



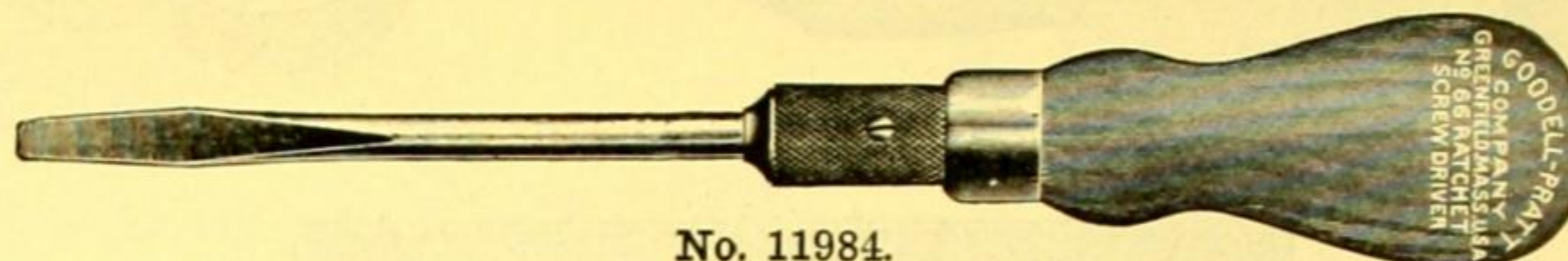
No. 11978.



No. 11982.



No. 11980.



No. 11984.



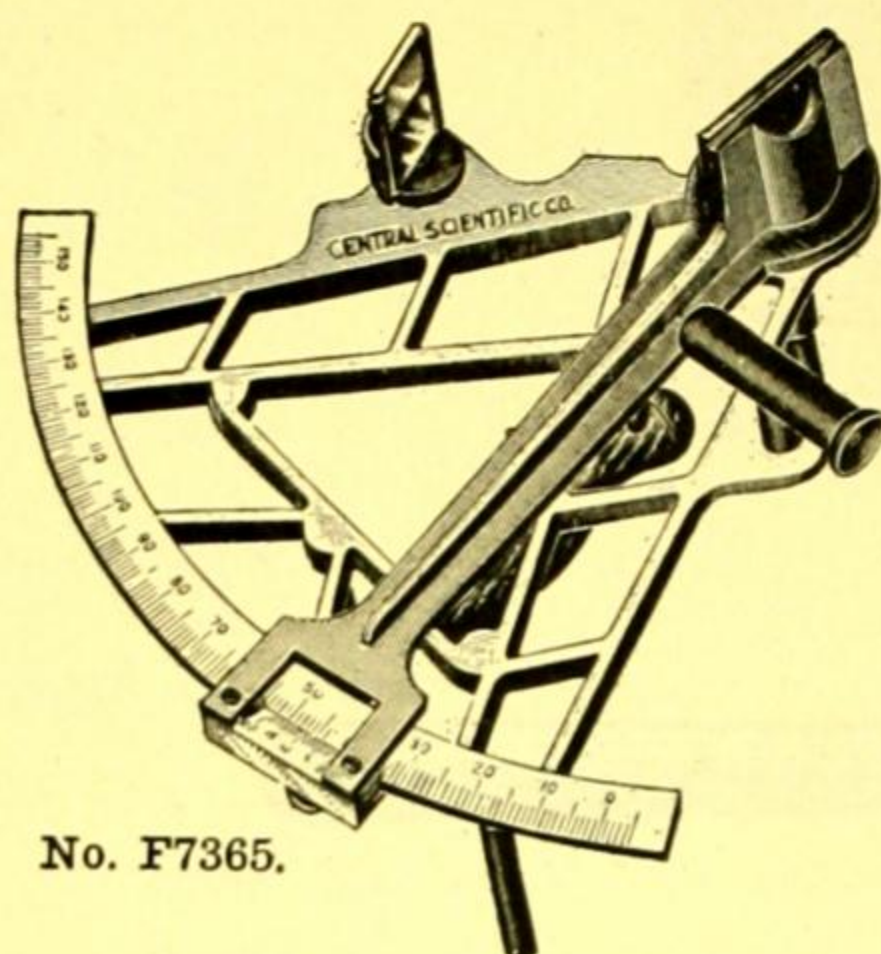
No. 11988.



No. 12000.



No. 12001.



No. F7365.

11978. **SCREW DRIVERS**, with steel blade in wooden handle.

Length, inches	4	8
Each	\$0.20	.35

11980. **SCREW DRIVER**, rosewood handle and finest steel blade, elegantly polished throughout. Especially adapted for instrument use. Indispensable to the laboratory. Length over all, 5½ inches; length of blade, 2 inches; width of blade, ⅛ inch..... .50

11982. **SCREW DRIVER, Jewelers'**, of steel, nickel-plated, with blade ⅛ inch in width. Length over all, 3¼ inches..... .35

11984. **SCREW DRIVER, Ratchet**, a high grade tool. Blade and ratchet mechanism made of oil tempered tool steel; changes from right to left are made by turning the knurled ferrule. Length of blade, 6 inches; width of blade, ¼ inch..... 1.20

11988. **SCREW DRIVER POCKET SET**, with 3 blades of assorted sizes and 1 reamer for making or enlarging holes. When not in use the blades are kept in the hollow handle. 3¼ inches long when closed; polished and nickel-plated..... 1.20

SCREW PITCH GAGE, see No. 6486.

12000. **SCREW TAPS**, standard.

No.	A	B	C	D	E	F	G	H	J
Screw gage No.....	2	4	6	6	8	8	10	12	14
Approx. diam., inches.....	5/64	7/64	9/64	9/64	5/32	5/32	3/16	7/32	1/4
No. threads to inch.....	56	36	32	40	32	40	32	24	20
Each	.35	.30	.26	.26	.26	.26	.30	.35	.45

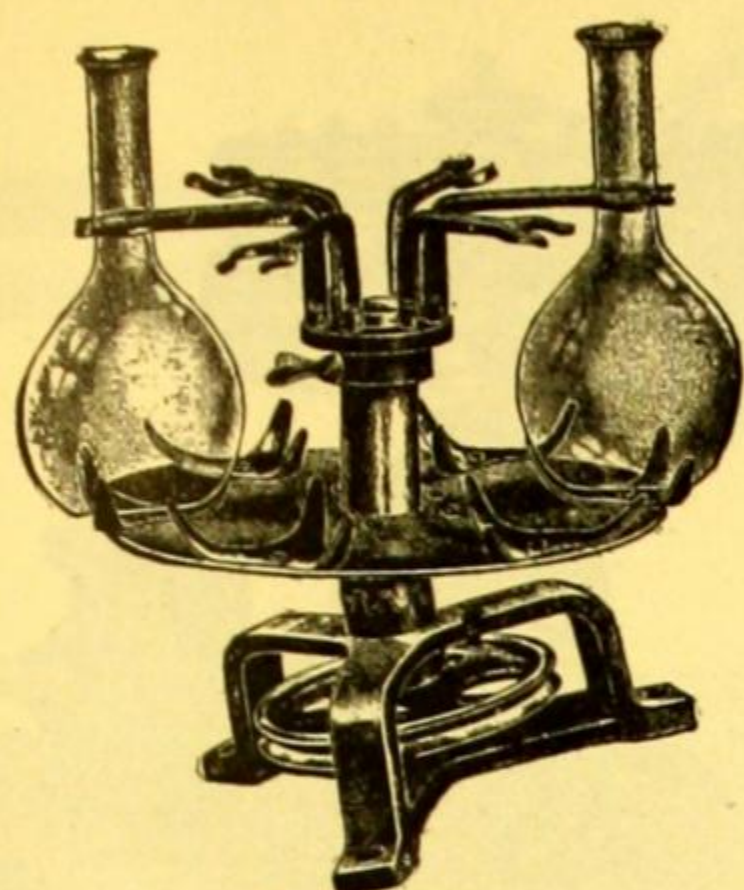
12001. **SCREW TAP WRENCH**, for taps ¼-inch and smaller 2.25

12010. **SEA SAND** for cleaning platinum ware.....per pound .10

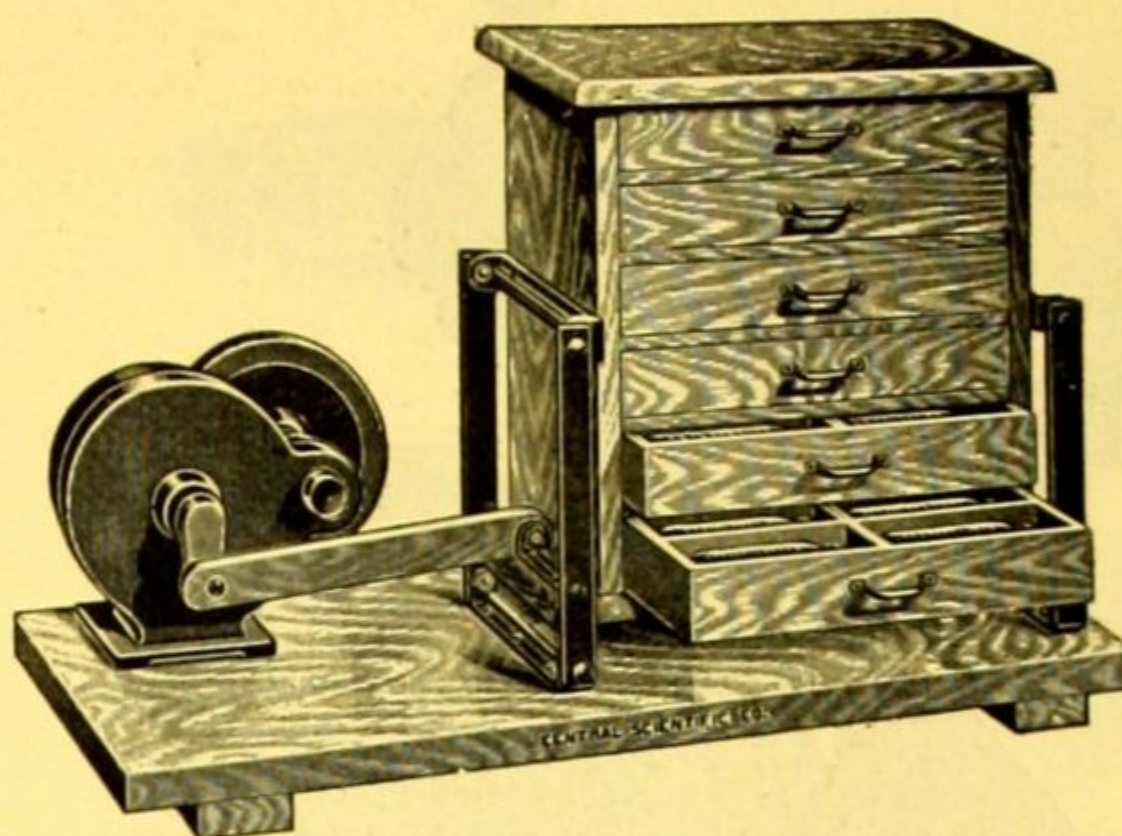
SEALING WAX, see Wax, Sealing.

SELENIUM CELLS, see Catalog F of Physical Apparatus.

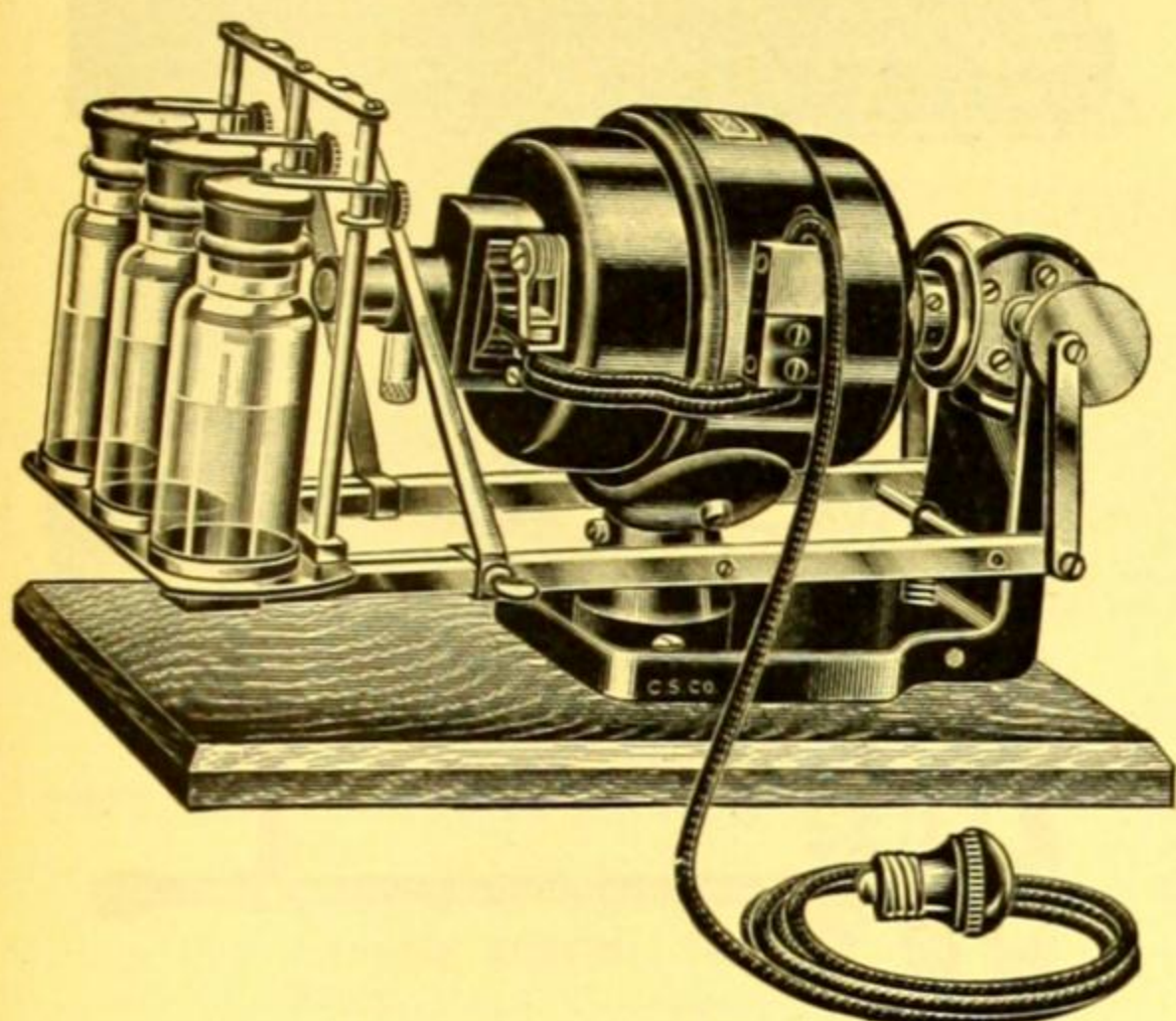
F7365. **SEXTANT, Metal Model**, full size, with which quite accurate work is possible. The main scale is graduated in 20 minute divisions and may be read to 30 seconds by means of the vernier on the index arm. Complete with mirror, mirror mountings, sight tube, handle and legs for support 37.50



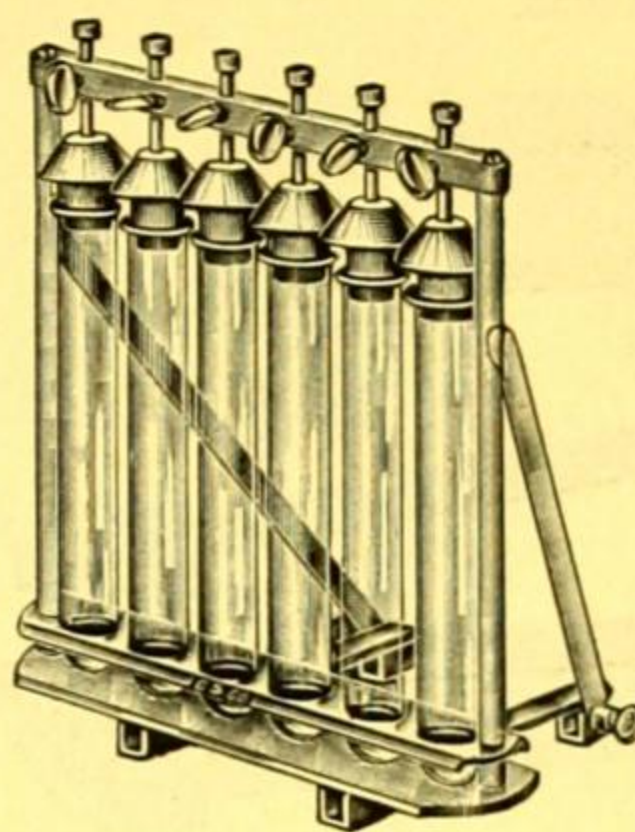
No. 12026.



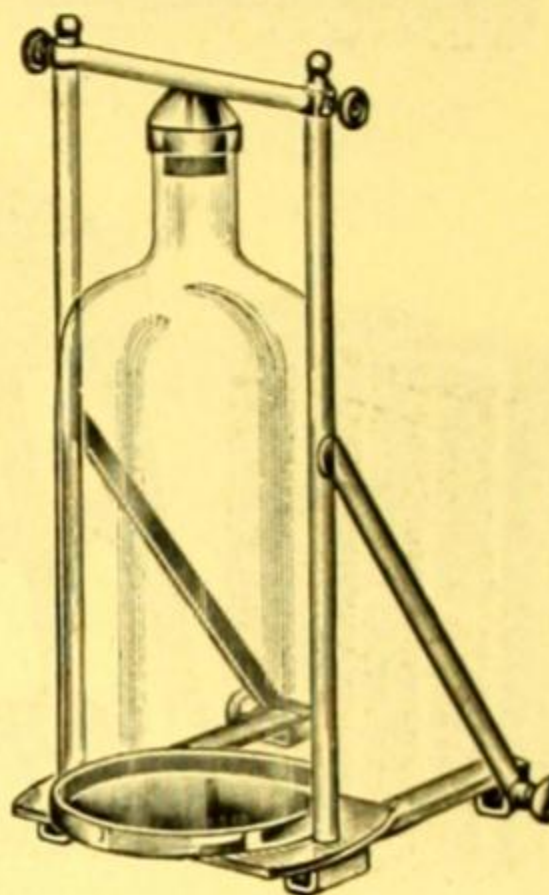
No. 12032.



No. 12034.



No. 12035.



No. 12036.

SHAKING APPARATUS

12026. **SHAKING APPARATUS**, Camp's (Patented), used extensively by the United States Steel Corporation and other steel and iron laboratories for the rapid precipitation of phosphorus by the molybdic acid method, and for dissolving steel or pig iron for carbon combustion. The disk is made to hold six flasks, Erlenmeyer or Florence shape, from 6 to 24 ounces capacity. Power required to operate, about $\frac{1}{25}$ h. p.; diameter of pulley, 6 inches; proper speed of operation, 100 to 140 r. p. m. \$30.00

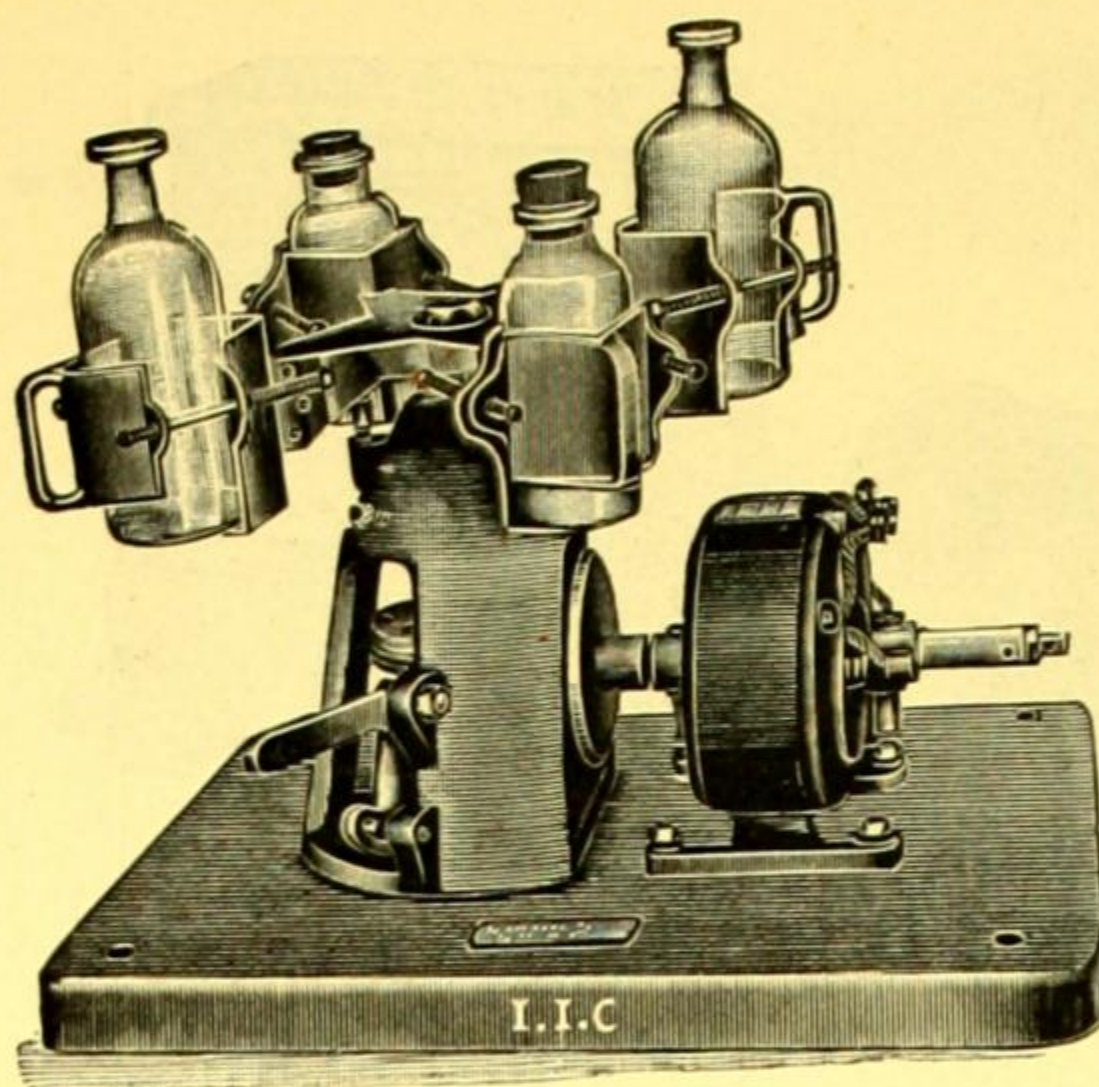
12032. **SHAKING APPARATUS**, Chest of Drawers Design, with polished hardwood chest containing six drawers, with a capacity of eight 250 cc bottles each. Requires $\frac{1}{4}$ h. p. motor to operate. Complete on hardwood base with enclosed gear but without motor. 100.00

12034. **SHAKING APPARATUS**, Electric, C. S. & E., for bottles or test tubes. The shaking frame is connected to the motor so as to impart a shaking motion analogous to the human method of shaking. The transmission of power from the motor to the shaking frame is accomplished by means of a friction drive which enables the degree of violence of shaking to be regulated. Complete with receptacle for three 4 oz. wide mouth bottles, three bottles, cord and attachment plug.

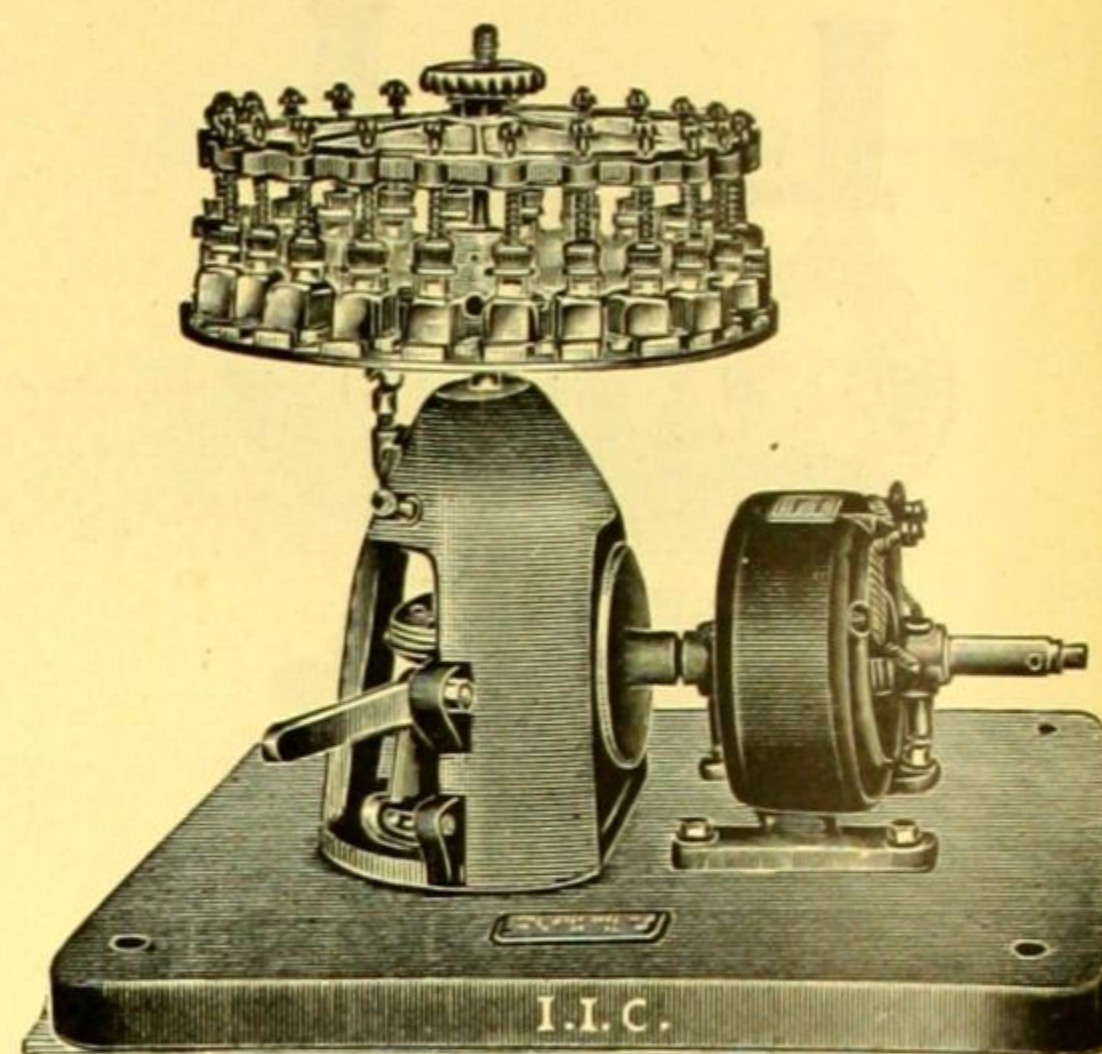
	A	B
No.	110 A. C.	110 D. C.
For volts	105.00	110.00
Each		

12035. **Test Tube Receptacle**, only for No. 12034, interchangeable with the 4 oz. bottle receptacle. Will take six 6x $\frac{3}{4}$ inch test tubes. Complete with six test tubes and rubber stoppers. 15.00

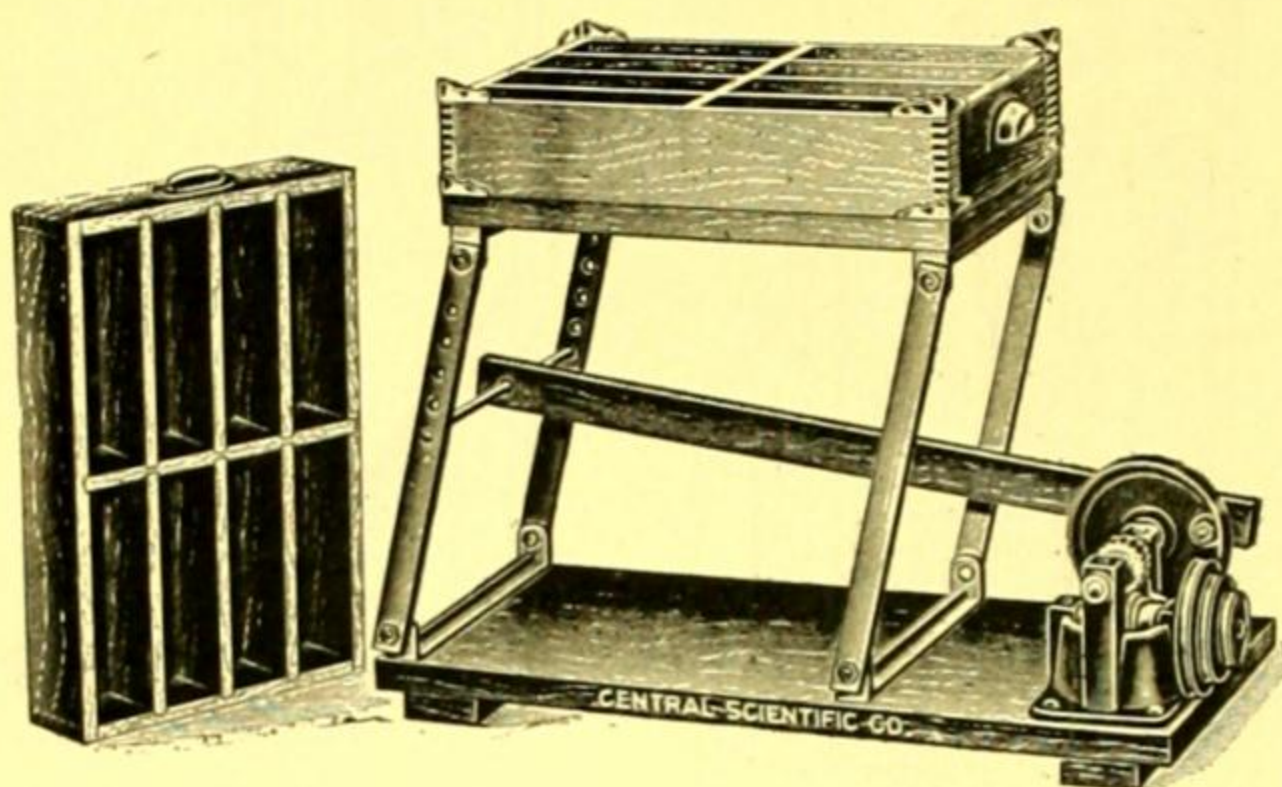
12036. **Bottle Receptacle**, only for No. 12034, for single 1000 cc bottle, interchangeable with the 4 oz. bottle receptacle. Complete with 1000 cc bottle and rubber stopper. 10.00



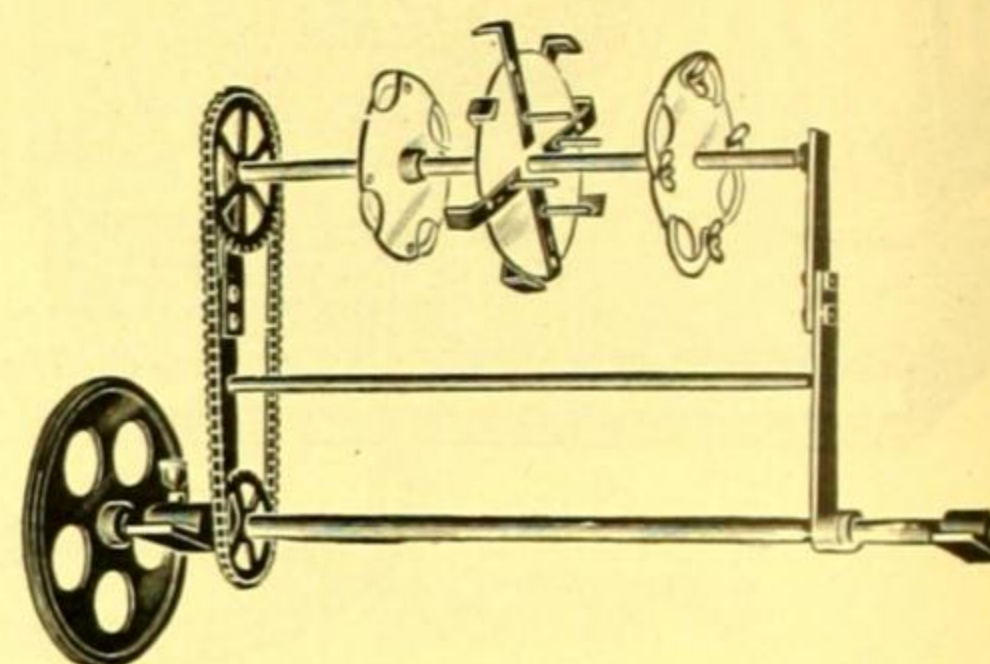
No. 12038.



No. 12048.



No. 12060.



No. 12070.

12038. **SHAKING APPARATUS, Electric, for four bottles.** Constructed of heavy cast iron making it strong and rigid, with ball bearings affording smoothness of motion. The clamps will take ordinary bottles from 200 to 1000 cc, and by means of blocks, smaller bottles and tubes may be held. The speed may be varied according to the load; for four 100 cc bottles, 300 r. p. m. should be used; for small bottles about 600 r. p. m. **Without bottles.**

No.	A	B	C	D
	A.C.		D.C.	
For volts.....	110	220	110	220
Each	\$165.00	167.00	165.00	167.00

12048. **SHAKING APPARATUS, Electric, Rickard's, for Sputum Bottles,** very convenient for laboratories examining many samples each day, as in Boards of Health. Arranged for shaking samples in the original collection bottles, thus obviating danger of confusion or contamination. If it is considered desirable to centrifuge the sputum in the same bottle, this may be done by using No. 2735 Sputum Bottle Carrier with Heads Nos. 2681 or 2685 and Centrifuges Nos. 2670 or 2696. With variable speed control for motor. Maximum speed with 24 bottles, about 600 r. p. m. **Without bottles.**

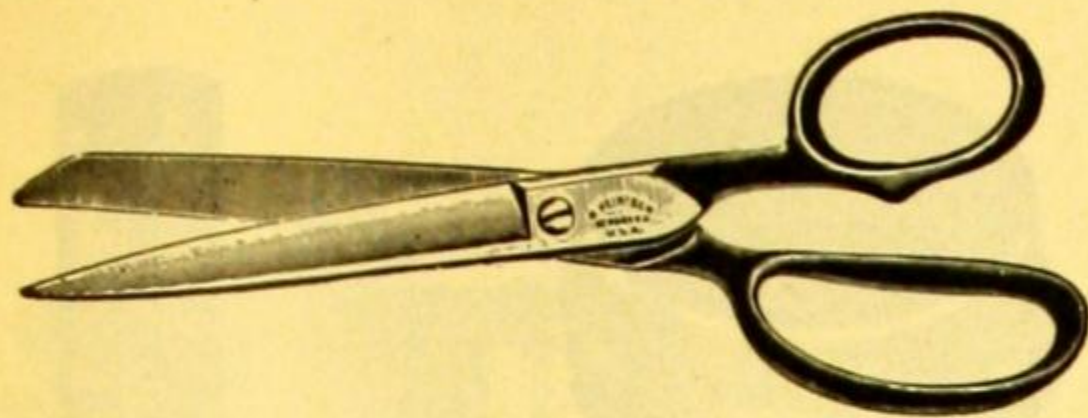
No.	A	B	C	D
	A.C.		D.C.	
For volts.....	110	220	110	220
Each	165.00	167.00	165.00	167.00

Sputum Bottles for No. 12048, see No. 2757.

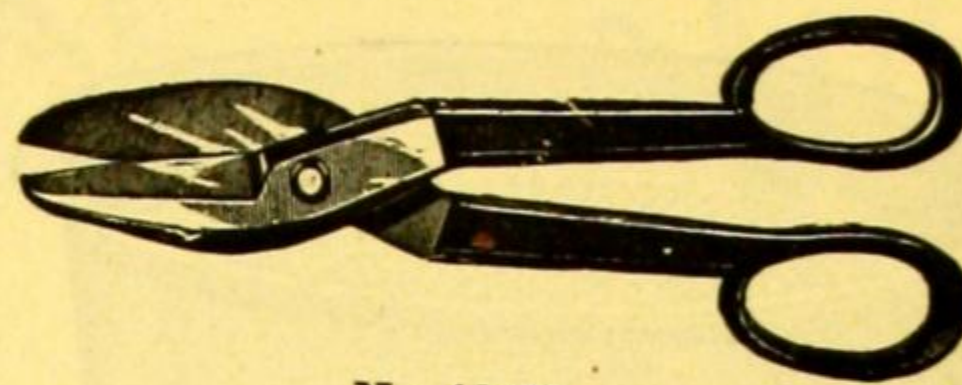
12056. **SHAKING APPARATUS, Horizontal Form,** for two bottles up to five liters capacity. With speed reducing gear from which three speeds may be obtained. Can be operated by $\frac{1}{8}$ h. p. motor. **Without motor**..... 80.00

12060. **SHAKING APPARATUS, Horizontal Form,** same as No. 12056, but with two hardwood trays, with a capacity of eight 250 cc bottles each 80.00

12070. **SHAKING APPARATUS, Massachusetts Institute of Technology Form,** for eight 250 cc bottles. Especially adapted for use in solubility determinations, conductivity work, etc..... 75.00



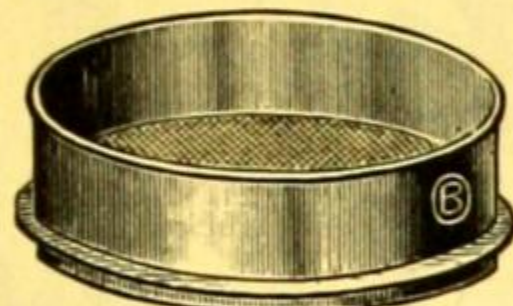
No. 12076.



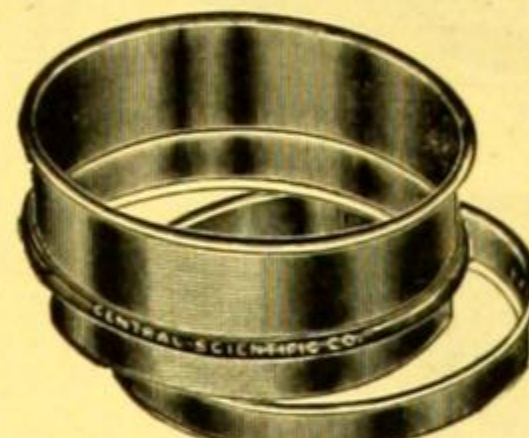
No. 12078.



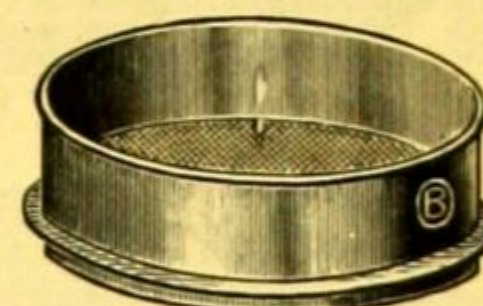
Nos. 12086-7.



Nos. 12084-5.



No. 12096.



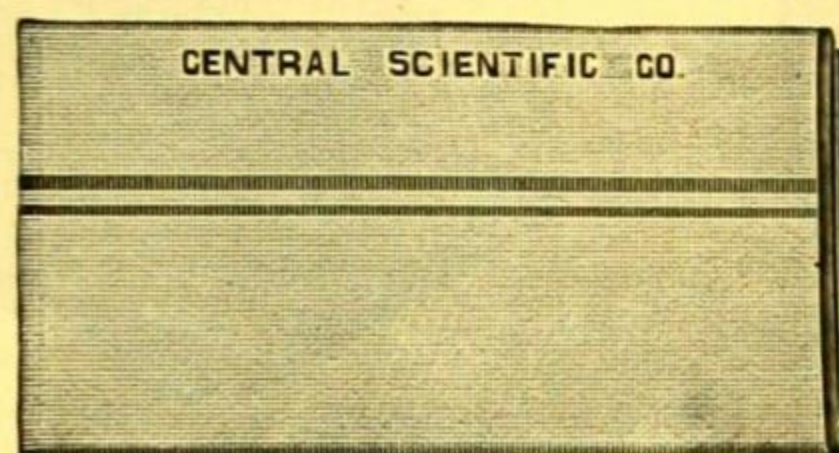
No. 12090.



No. 12102.



No. 12104.



No. 12098.

12076. SHEARS, Paper, high grade steel.

No.	A	B	C	D
Length of blades, inches.....	3	4	6	8
Length overall, inches.....	6	8	10	12
Each	\$0.80	1.00	1.50	1.80

SHEARS, Pruning, see Catalog A of Agricultural Apparatus.

12078. SHEARS, Tinnors' Snips, for cutting metal. Length of cut, 2½ inches..... 1.50

SIEVES

SIEVES, Brass Frame, seamless, brass gauze (for Covers and Bottom Pans see Nos. 12102 and 12104).

	10	20	40	60	80	100	200
Mesh	1.50	1.50	1.50	1.60	1.60	1.65	3.35
12084. Each, 5 inches in diameter.....	2.50	2.50	2.50	2.60	2.70	3.00	7.60
12085. Each, 8 inches in diameter.....							

SIEVES, same as Nos. 12084 and 12085, in sets of five, one sieve fitting on top of another, with one cover and one bottom pan; set consists of 20, 40, 60, 80 and 100 mesh.

12086. Per set, 5 inches in diameter.....	9.00
12087. Per set, 8 inches in diameter.....	15.25

12090. SIEVES, Brass Frame, seamless, having sheet brass bottom with circular perforations. Extensively used in soil analysis and seed testing. Diameter, 5 inches.

Diameter of perforations, mm.....	1½	1	2	3	5
Each	1.50	1.50	1.50	1.50	1.50

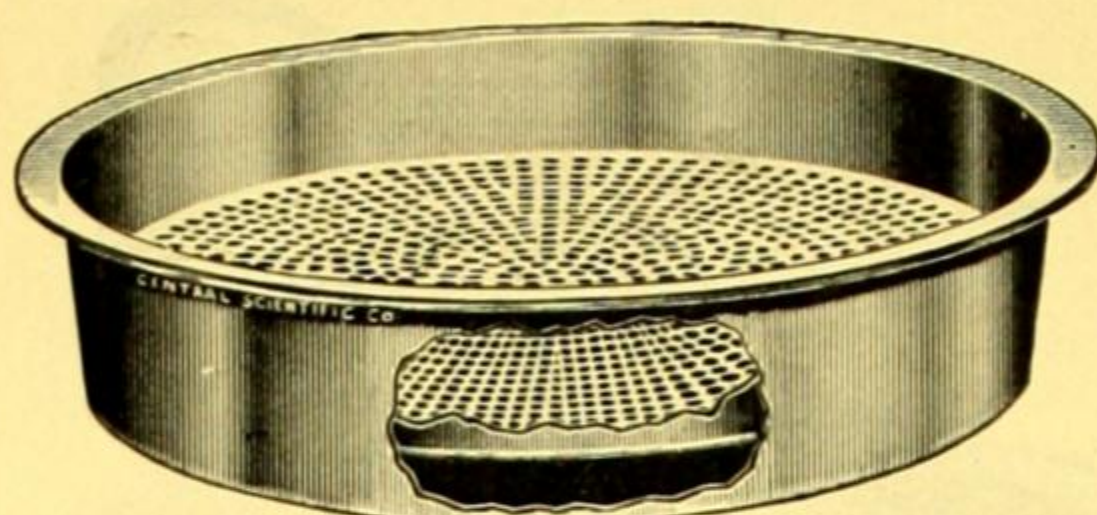
12091. SIEVES, complete set of five of No. 12090, with brass cover and bottom pan..... 5.75

12092. SIEVES, set same as No. 12091, with 3 mm and 5 mm sieves omitted..... 1.30

12096. SIEVE FRAME, same as No. 12090 without bottom, but with brass ring for holding bolting cloth. Diameter, 5 inches..... 1.30

No.	2	5	7	9	11	13	15
Mesh per linear inch.....	52	64	80	96	116	130	148
Per linear foot.....	2.10	2.30	2.50	3.00	3.50	4.00	4.50

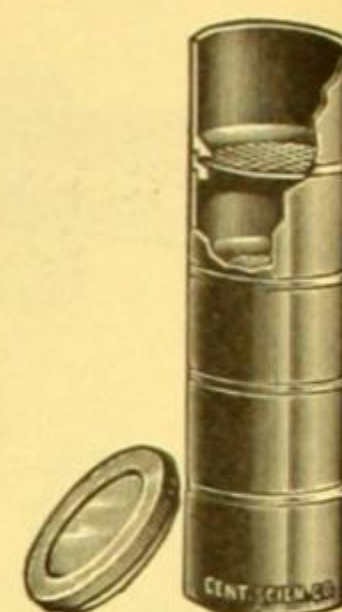
12102. Covers for Nos. 12084 to 12096.
Diameter, inches70 8
Each 1.1012104. Bottom Pans for Nos. 12084 to 12096.
Diameter, inches60 8
Each 1.00



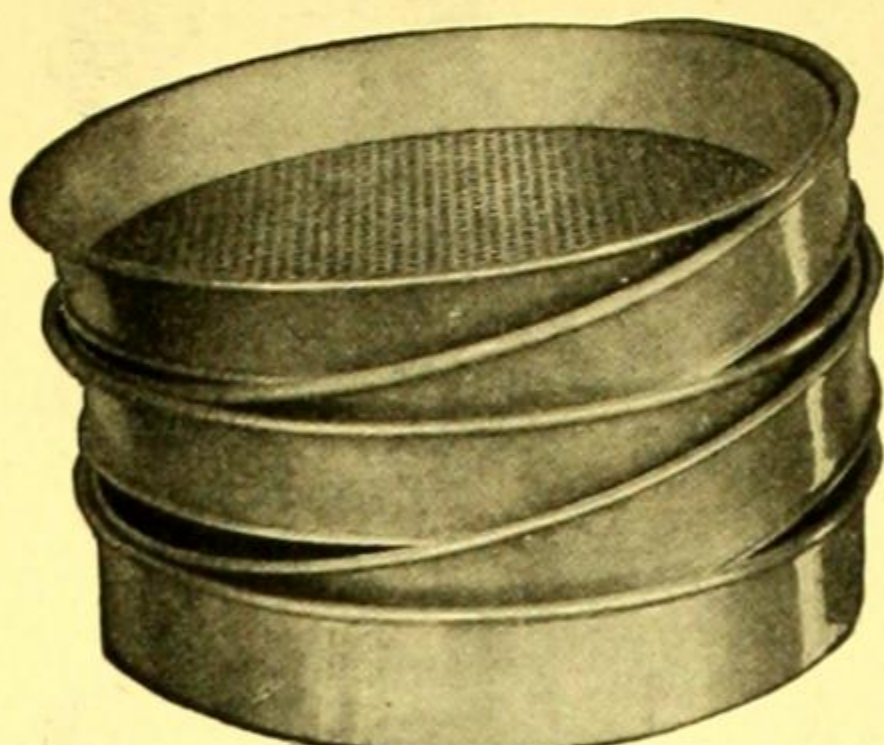
No. 7398.



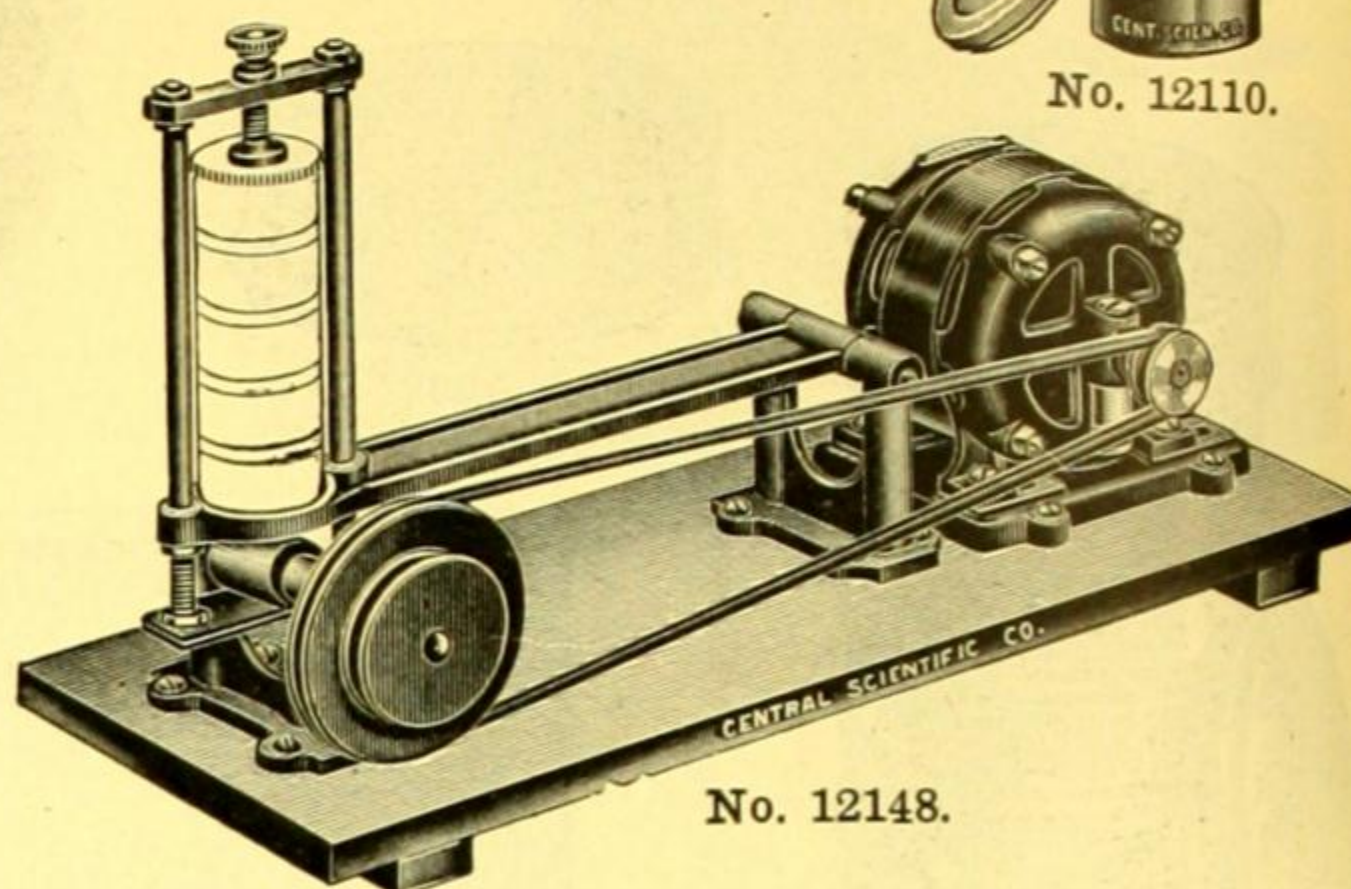
No. 12136.



No. 12110.



No. 7402.



No. 12148.

12110. **SIEVES, Bureau of Soils Type**, as employed in the Laboratories of the Bureau of Soils, Washington, D. C., for mechanical analysis. Set of four sieves turned from heavy brass castings with bottom pan and cover, each about 2 inches in diameter by 1 inch high, perfectly fitted, so that the set may be well shaken without coming apart. Shaped so that there is no loss of the sample, a great advantage where small samples are being tested. Sieves proper are readily replaceable; upper two of brass, with perforations 1 mm and 0.5 mm in diameter; lower two of bolting cloth 64 and 130 meshper set \$12.00

For Shaker for No. 12110 Sieves, see No. 12148.

7398. **SIEVES, Corn Test**, according to specifications of the United States Department of Agriculture. The set consists of one sieve with 14/64 inch round holes, and one bottom pan, of aluminum, 13 inches in diameter by 3 inches deep..... 4.00

12124. **SIEVES, Standard, Brass Frame**, seamless, brass gauze, according to the specifications of the American Society for Testing Materials; diameter, 8 inches.

Mesh	10	20	30	40	50	60	70	80
Each	3.60	3.60	3.60	3.60	3.90	3.90	4.10	4.45
Mesh		90	100	120	140	150	180	200
Each		4.80	5.20	5.50	6.25	6.60	8.40	9.15

12125. **Covers and Bottom Pans** for No. 12124.....per set 3.00

7402. **SIEVES, Wheat Dockage**, according to government specifications, consisting of a set of four sieves, 13 inches in diameter, with bottom pan, constructed of aluminum, telescoping. Consists of a buckwheat sieve with 8/64 inch triangular perforations; a fine seed sieve with 1/12 inch round perforations; a scalper sieve with 12/64 inch round perforations; and a coarse chess sieve with perforations 0.070 inch wide and 1/2 inch long. (See U. S. Department of Agriculture Handbook for 1920, "Official Grain Standards for Wheat, Shelled Corn and Oats")2.....per set 8.00

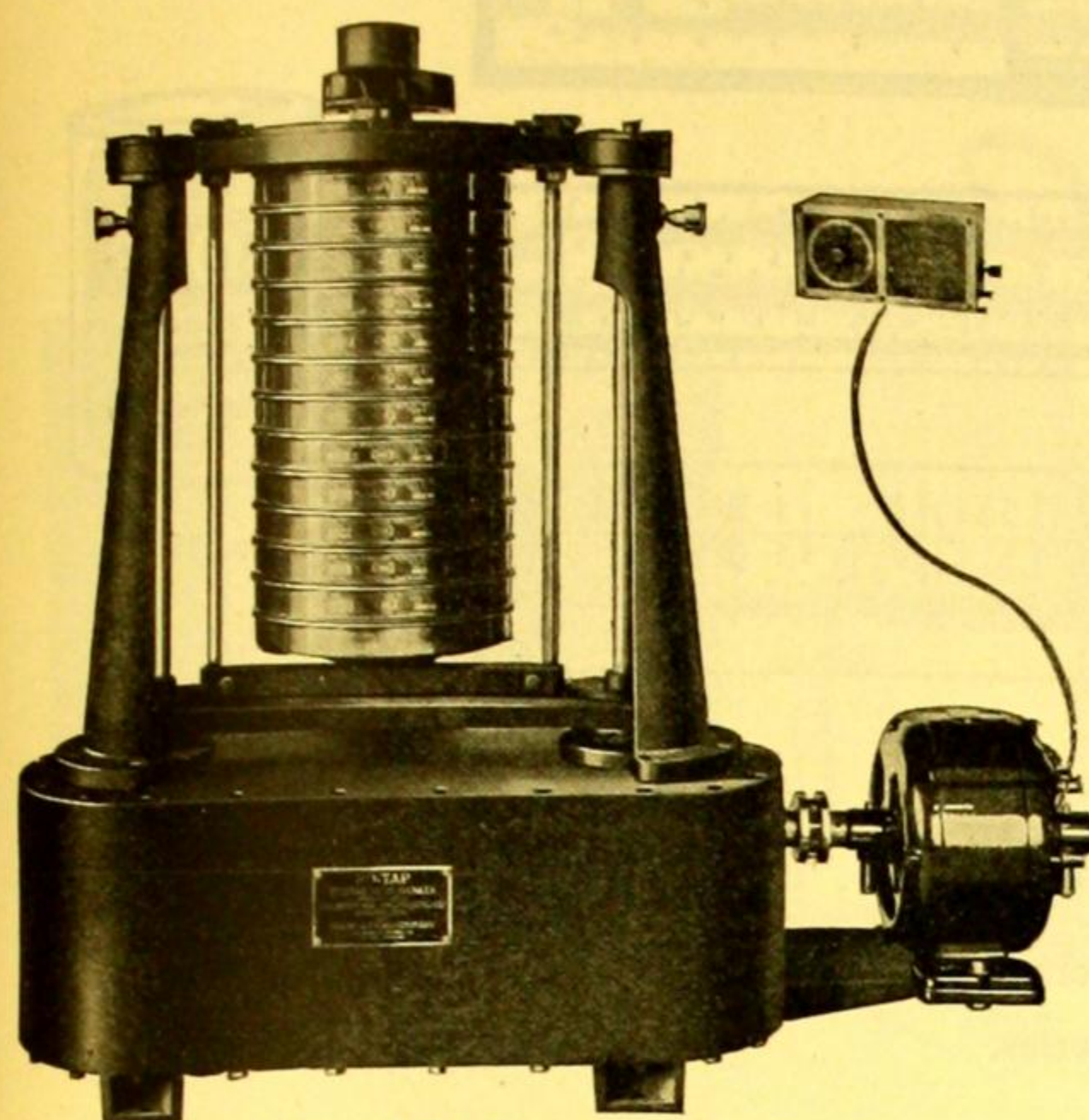
Note:—Fine chess sieve with perforations 0.064 inch wide and 3/8 inch long may be substituted for the coarse chess sieve if desired.

12136. **SIEVES, Wood Frame**, brass gauze. Diameter, 6 inches.

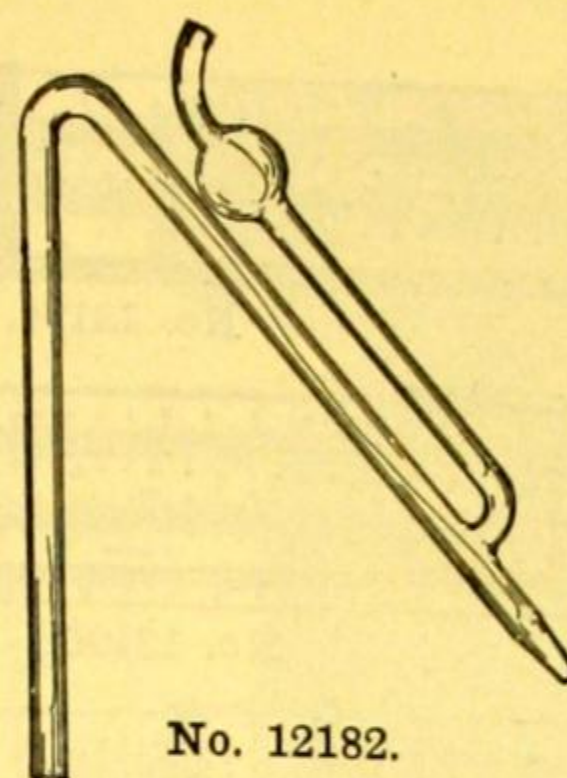
Mesh	20	40	60	80	100	200
Each	.65	.70	.80	1.00	1.10	2.25

12148. **SIEVE SHAKER, for Power**, for use with No. 12110 Sieves. A motor of 1/20 h. p. is mounted on the same base with an eccentric shaft, to which it is belted. The set of sieves is clamped in a frame at the end of a long lever arm which rests on the eccentric. This lever arm is so attached to the eccentric that with each revolution of the cam the sieves are struck sharply, raised and dropped with a motion similar to that used in shaking by hand. Without sieves. (See Bulletin No. 84, United States Department of Agriculture, Bureau of Soils.)

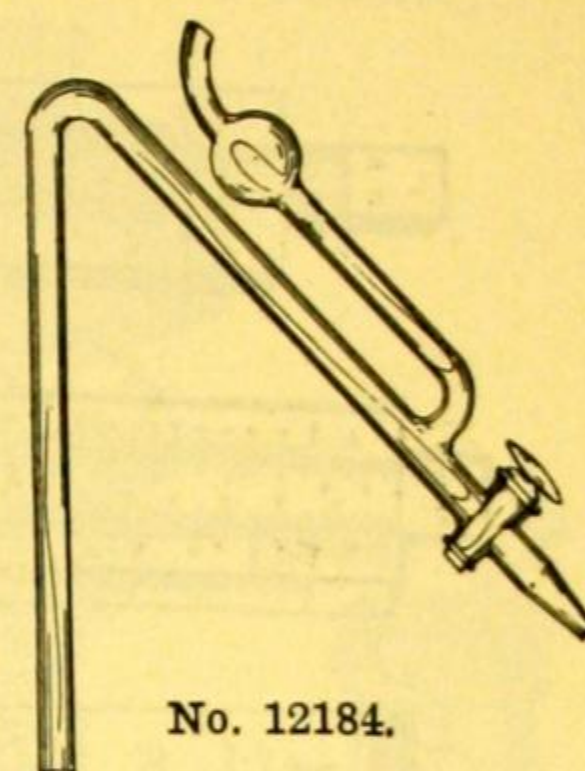
No.	A	B	C	D
For volts	A. C.			D. C.
Each	110	220	110	220
	52.50	54.00	50.00	52.50



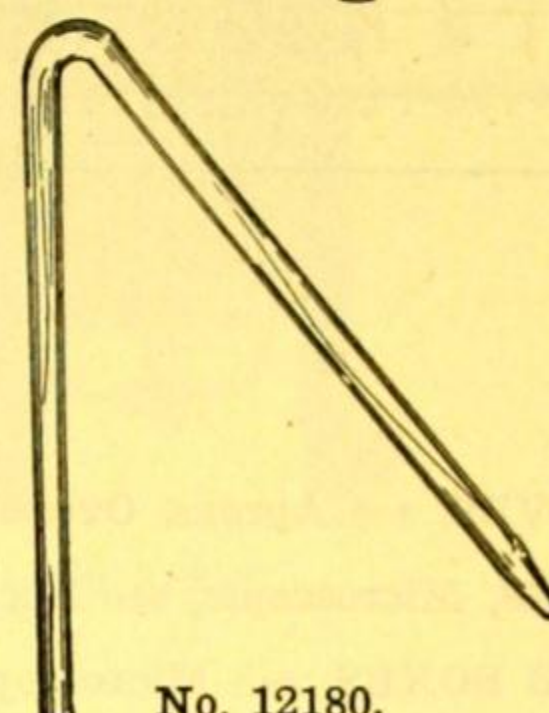
Nos. 12152-3.



No. 12182.



No. 12184.



No. 12180.

12152. **SIEVE SHAKER, Ro-Tap, Electrically Driven.** This machine reproduces the circular and tapping motions of hand sieving, with a uniform mechanical action, which produces reliable results and standardizes laboratory methods. Ruggedly constructed with heavy base and substantial supporting columns. Running parts operate in oil. By means of No. 12153 Stop-Rite Time Switch, the process may be made entirely automatic, as the switch may be set for any desired time interval, and the test will be automatically stopped at the end of that time. Capacity of the machine, 6 standard height 8 inch sieves with bottom pan, or 13 half standard height sieves with bottom pan. Complete with direct connected 110 volt motor, but without sieves or Stop-Rite Time Switch. No.

	A	B	C	D
	A.C.		D.C.	
For volts	110	220	110	220
Each, F. O. B. Cleveland.....	\$302.50	302.50	302.50	302.50

12153. **Stop-Rite Time Switch**, for use with No. 12152 Ro-Tap Sieve Shaker. May be set for any desired interval and will automatically stop machine at the end of the pre-determined period F. O. B. Cleveland 27.50

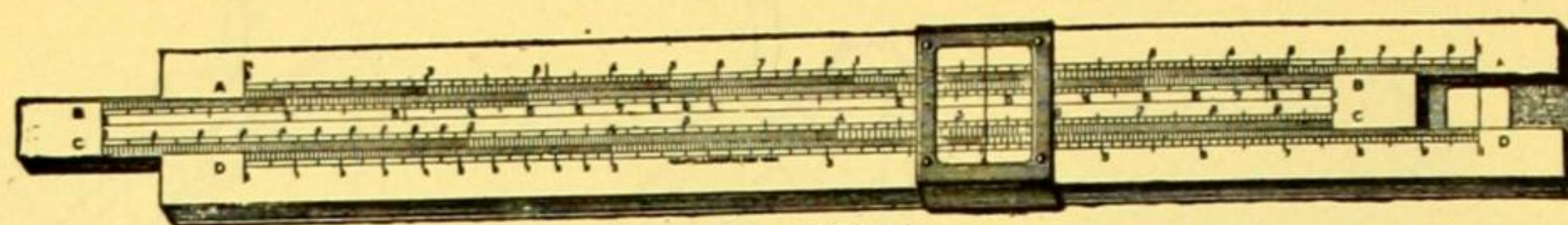
12168. **SILICA TUBING, Opaque Fused Silica**, glazed at the ends and smooth inside. Sizes up to $\frac{3}{4}$ inch have satin finish. Very resistant to sudden changes of temperature. For combustion work, the glazed Combustion Tubing No. 3186 glazed inside and outside and gas tight should be selected. In lengths up to 8 feet.

	3	.4-5	.6-7
Diameter, inside, mm.....	.5-2.5	.5-2.0	.5-2.0
Thickness of wall, mm.....	.56	.89	1.25
Per foot			

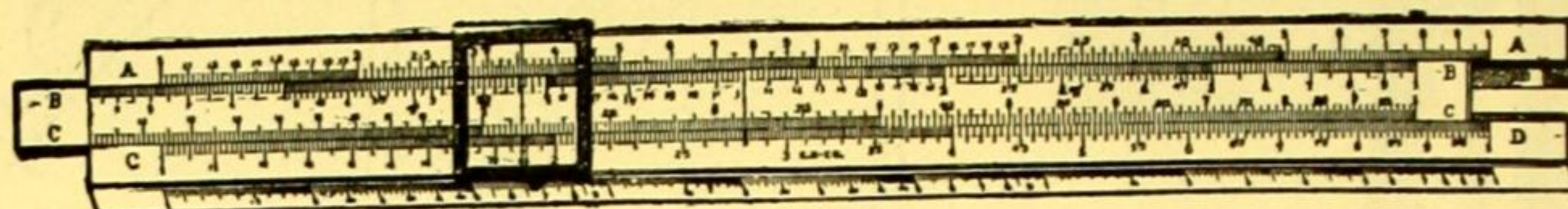
In ordering specify diameter and thickness of wall.

Other sizes supplied to order.

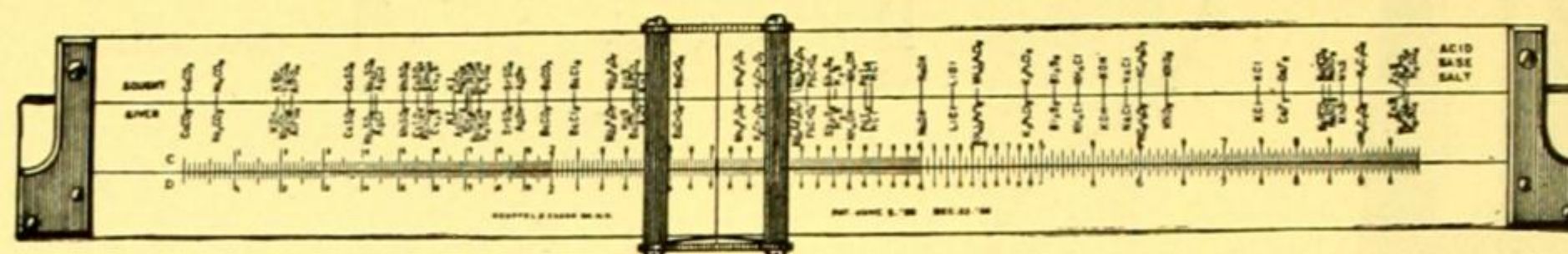
12180. **SIPHONS, Glass, plain form.**
- | | | |
|--------------------------------------|-----|-----|
| No. | A | B |
| Length of delivery tube, inches..... | 12 | 18 |
| Each | .30 | .45 |
12182. **SIPHONS, Glass, with suction tube.**
- | | | |
|--------------------------------------|-----|-----|
| No. | A | B |
| Length of delivery tube, inches..... | 12 | 18 |
| Each | .50 | .80 |
12184. **SIPHONS, Glass, with suction tube and stopcock.**
- | | | |
|--------------------------------------|------|------|
| No. | A | B |
| Length of delivery tube, inches..... | 12 | 18 |
| Each | 1.60 | 2.40 |



No. 12194.



No. 12196.



No. 12200.



No. 12210.

SLIDE RULES

SLEEVES, see Aprons, Oversleeves and Laboratory Coats.

SLIDES, Microscopic, see Microscope Accessories.

SLIDE BOXES, see Microscope Accessories.

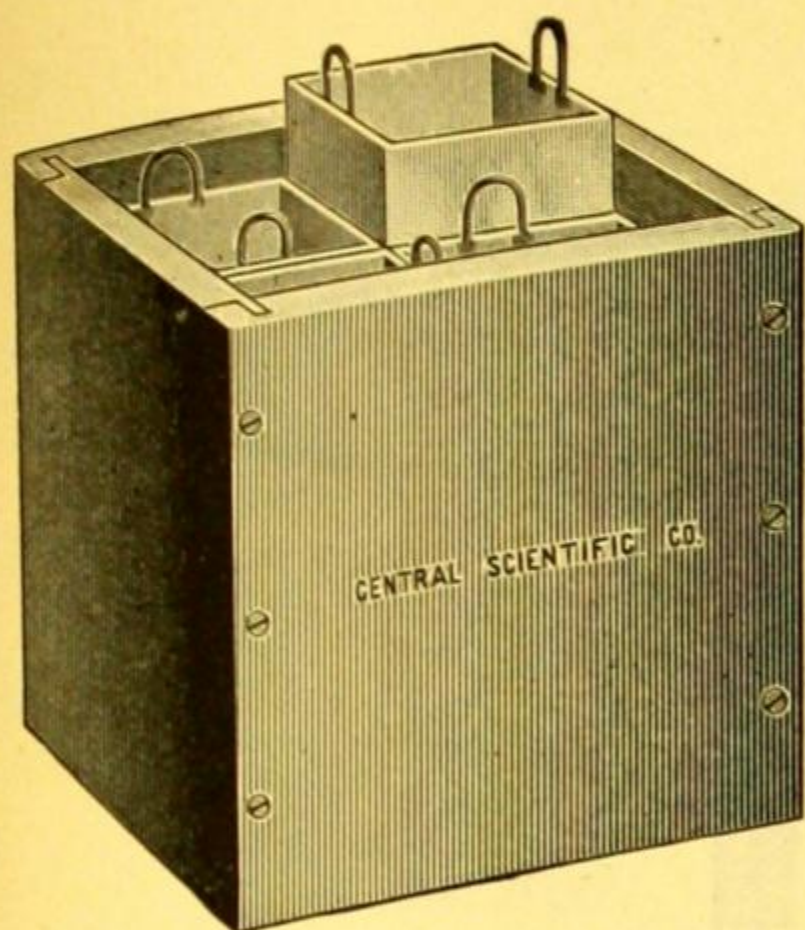
12190. **SLIDE RULE, Woodworth**, a simple machine for multiplying and dividing. It is printed on heavy bristol board, ready for the student to cut and fit together. Recommended by the Central Association of Science and Mathematics Teachers Each \$0.12
Per dozen 1.20
12192. **SLIDE RULE, Mannheim**, 10-inch, graduations on white paper, with a protective coating, mounted on hardwood..... 1.25
12194. **SLIDE RULE, Mannheim**, fine quality, 10-inch, in case with book of instructions..... 4.00
12196. **SLIDE RULE, Multiplex**, 10-inch, useful in solving all arithmetical, trigonometrical, and logarithmetical problems which are possible with the Mannheim, and has also the following characteristic advantages: Multiplication of three numbers in one setting; division of one number by two numbers in one setting; more convenient solution of inverse proportion; direct solution in a single setting of a series of divisions with constant dividend; direct reading of cubes and cube roots; direct reading of three-halves and two-thirds powers; direct solution in a single setting of many combined operations. In case with book of instructions..... 6.25
12200. **SLIDE RULE, Chemists' Duplex**, 10 inches in length, engine divided. The rule carries 138 chemical symbols which include the common acids, bases, salts, oxides, and elements employed by the average chemist. As each symbol has its individual position corresponding to the logarithm of its molecular weight, the number of permutations and combinations possible covers the requirements of almost any problem. By using the logarithmic and cologarithmic scales in conjunction with the chemical gage points, problems in Stoichiometry, such as Gravimetric Analysis, Volumetric Analysis, Equivalents, Percentage Composition, Conversion Factors, Volume of Gas from a given weight of substance at different temperatures and pressures, and many other analogous problems are readily solved. Aside from the solution of the chemical problems above referred to any arithmetical problems solvable by logarithms are readily and accurately done with a minimum number of settings. With glass indicator, in morocco covered case with full directions..... 12.00

SNIPS, Tinnners', see Shears.

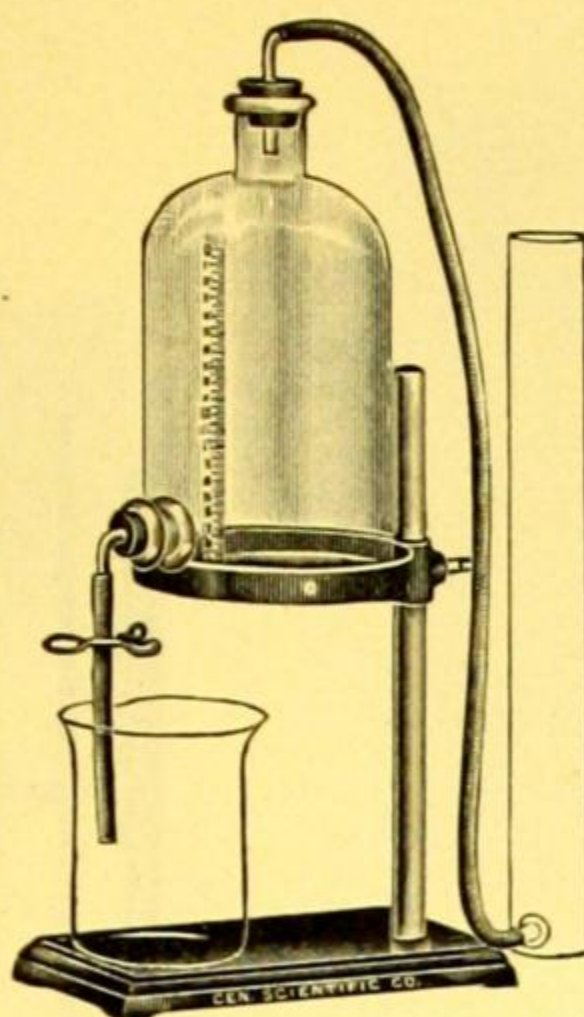
12210. **SOAP, Green Oil, U. S. P. Quality**, a soft soap of potash base with strongly detergent properties. Widely used for antiseptic purposes in hospitals and medical laboratories in connection with surgical and bacteriological work. Useful for many purposes around the chemical laboratory, such as cleaning glass and porcelain, desk tops, sinks, stained hands, linoleum or tile floors. In concentrated form, for solution in water, in friction top metal cans.
- | | | |
|----------------------|-------|------|
| No. | B | C |
| Weight, pounds | 2 1/2 | 5 |
| Each | .80 | 1.55 |

SOAP, Palm Oil, see No. 8952.

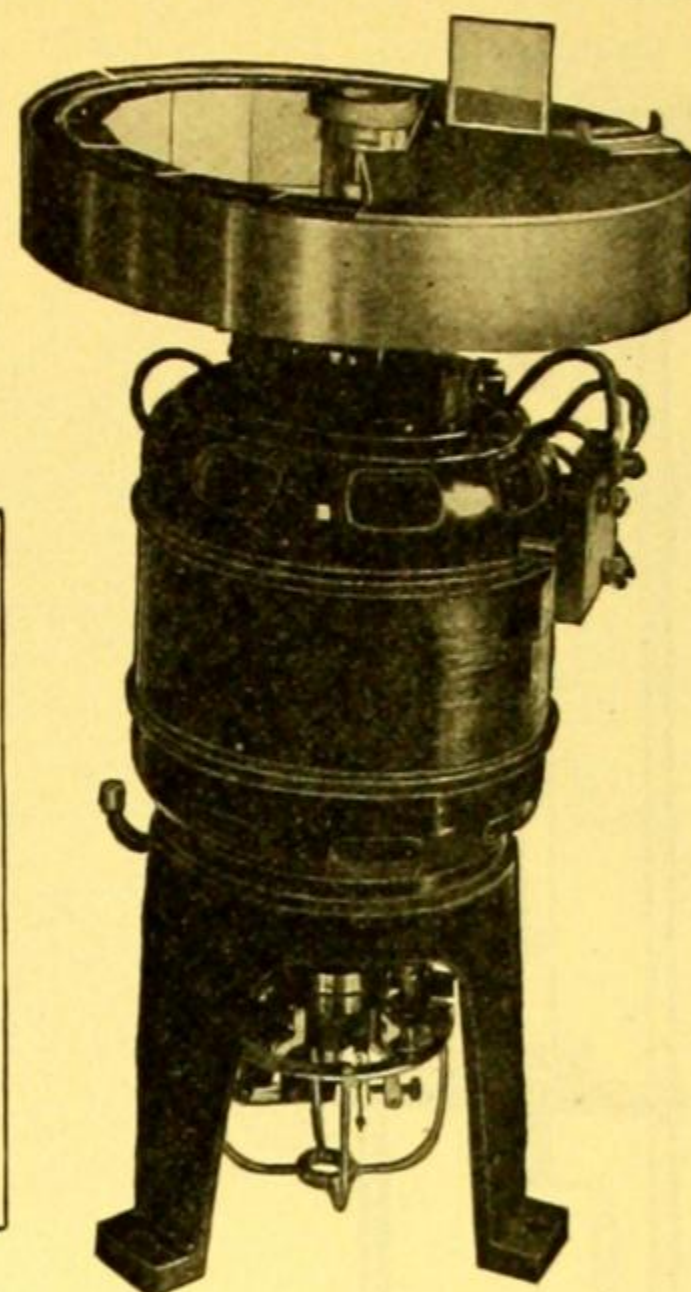
SODIUM SPOONS, see Spoons, Sodium.



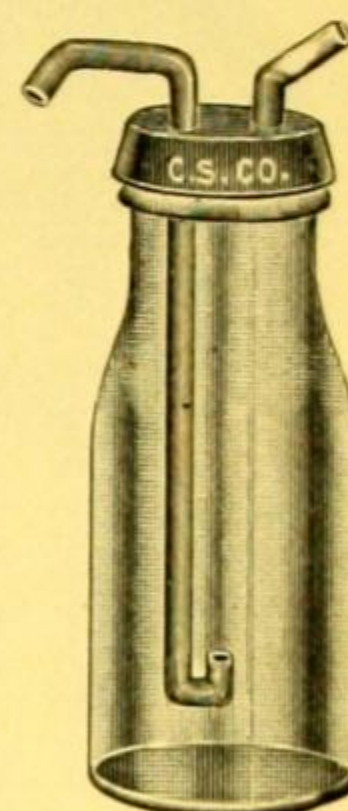
No. 12220.



No. 12228.



No. 12252.



No. 12238.

SOIL ANALYSIS APPARATUS

INCLUDING APPARATUS FOR PHYSICAL PROPERTIES OF SOILS

ARRANGED ALPHABETICALLY

12220. **ABSORPTION APPARATUS, Heat**, for absorption of heat by soils, as described by Stevenson & Schaub. This apparatus is used to compare the temperatures of various soils at different depths when the soils are exposed to the direct rays of the sun, and consists of four zinc boxes 4x4x8 inches deep, enclosed in a wooden box open at the top. \$7.50
12228. **ASPIRATOR, McCall**, for studying the rate of the flow of water through soils of different textures. This aspirator has no moving parts to cause errors from friction and the method of operation is exceedingly simple. The bottle is first filled with water to a definite mark on the scale and connections are made as shown in the illustration. The pinchcock is then opened and water allowed to run from the bottle until it stands at a much lower level. By noting the time required with different soils, the relative rate of flow is readily determined. Complete as illustrated, with metal support, but without soil tube or beaker. 8.75
12229. **Support only of No. 12228**. 4.00
12230. **Aspirator Bottle only of No. 12228**. Complete with rubber stoppers, rubber tubing, and pinchcock 4.75

AUGERS, see Soil Sampling Apparatus.

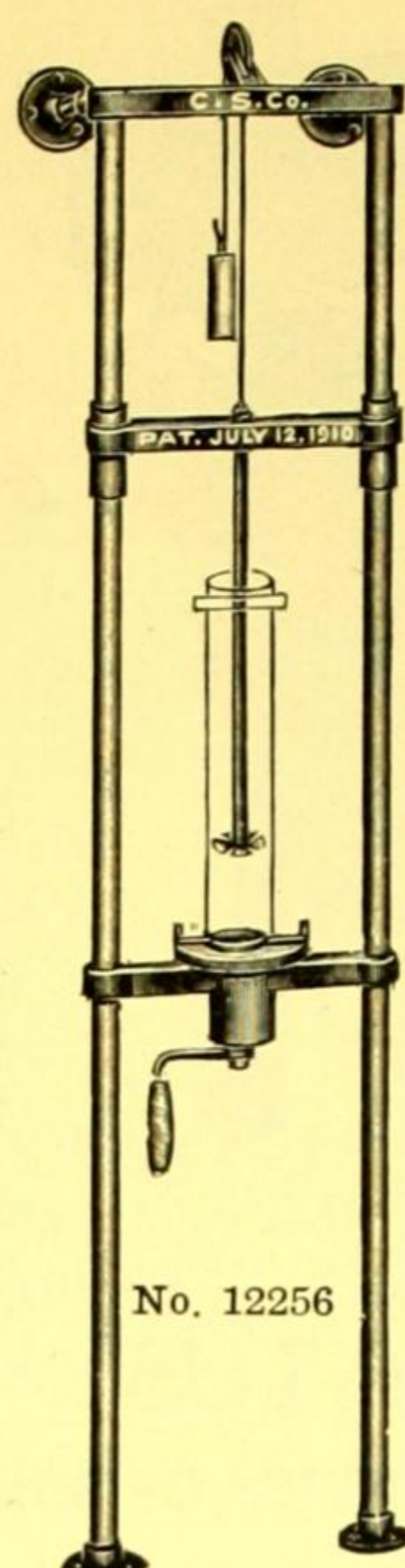
BINS OR CONTAINERS for Soil, see general heading Bins or Containers.

12238. **BOTTLE, Mechanical Analysis**, convenient for separating soils into their constituent parts, as described in Mosier and Gustafson's "Soil Physics Laboratory Manual." Complete with inverted rubber stopper and tubes.70

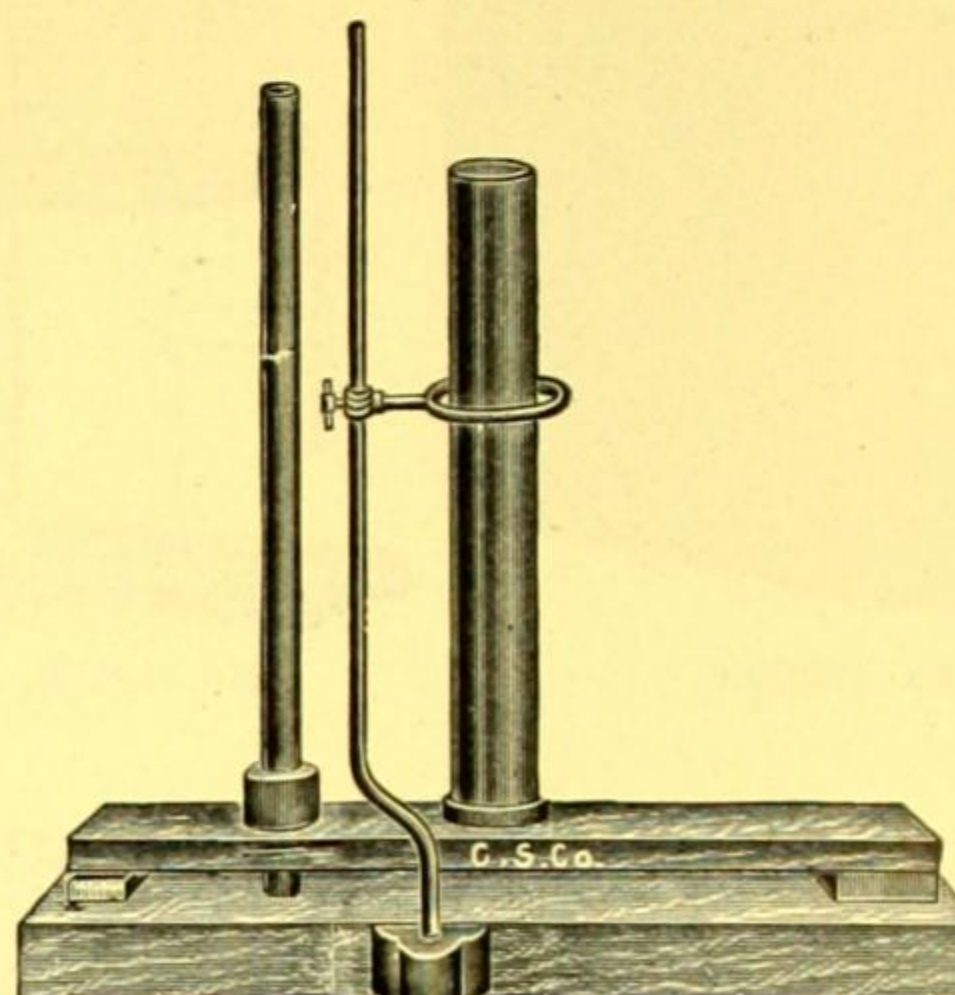
CARBONIC ACID APPARATUS, see general heading Carbon Dioxide Determination Apparatus.

12252. **CENTRIFUGES, Moisture Equivalent, Briggs-McLane**, as described in the Proceedings of the American Society of Agronomy, Volume 2, 1910.
This centrifuge is used for determining the relative moisture equivalents of soils where the term moisture equivalent designates the maximum percentage of moisture which a soil can retain in opposition to a known centrifugal force. For a standard of comparison, a centrifugal force equal to 1,000 times the force of gravity has been adopted. In making the determinations, the soils, suitably moistened, are placed in cups with perforated bottoms. These cups are then placed in the cylinder of the centrifuge and rotated at a constant speed, so chosen as to develop the required centrifugal force. "Each soil now loses water until the capillary forces have increased sufficiently to balance the centrifugal force acting on the soil moisture. Since the moisture content of each soil which has been treated in this way

(Continued on next page.)



No. 12256



No. 12258.

CENTRIFUGES, Moisture Equivalent, Briggs-McLane, continued.

is in capillary equilibrium with the same force, it follows that if these moist soils are placed in contact in any order whatever no movement of water from one soil to another will take place. A condition of complete equilibrium exists throughout the series of soils thus treated." It is then necessary only to determine the moisture content of each soil corresponding to this condition of equilibrium in order to determine its quantitative position in the scale of moisture retentiveness. The centrifuge here described is capable of maintaining the required centrifugal force well within the desired limit of accuracy.

The instrument consists of a bronze disk cylinder containing 16 soil boxes with wire gauze bottoms, and attached to the shaft of a vertically mounted D. C. motor. The motor is provided with a Kellogg Constant Speed Governor. If alternating current only is available, a motor-generator set should be used to produce the direct current necessary. See Nos. 4826 to 4848. Complete as described.

No.	A	B
For volts	110	220
Each	\$325.00	325.00

NOTE:—To determine accurately the speed of rotation of No. 12252, we recommend our No. 13302 Precision Tachometer.

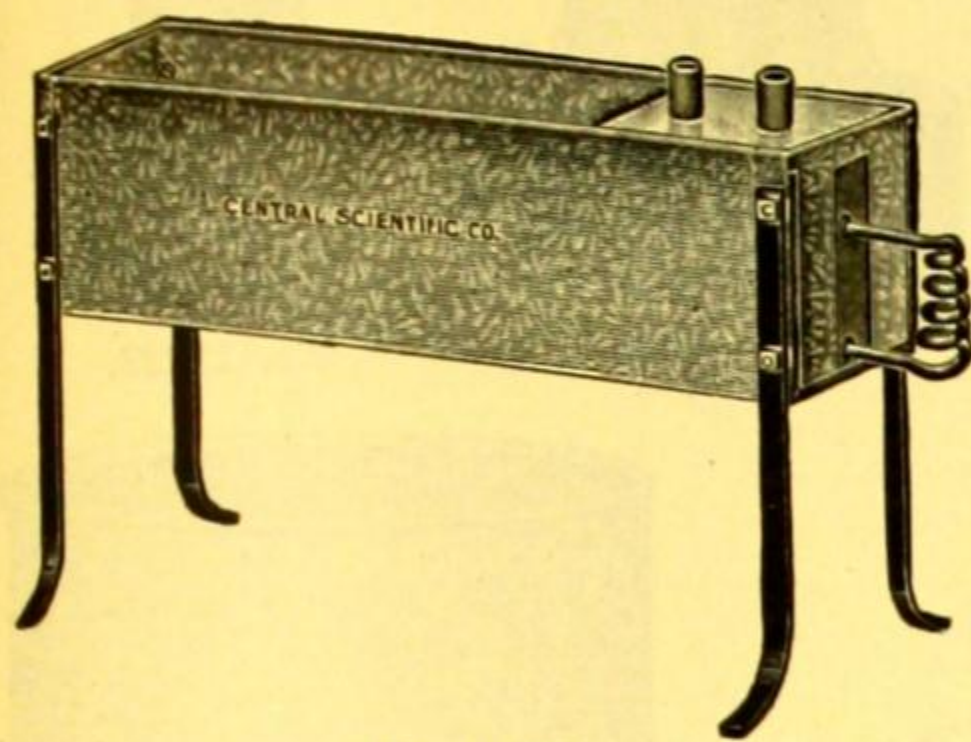
For other **CENTRIFUGES**, see general heading **Centrifuges**.

COLORIMETERS, see general heading **Colorimeters**.

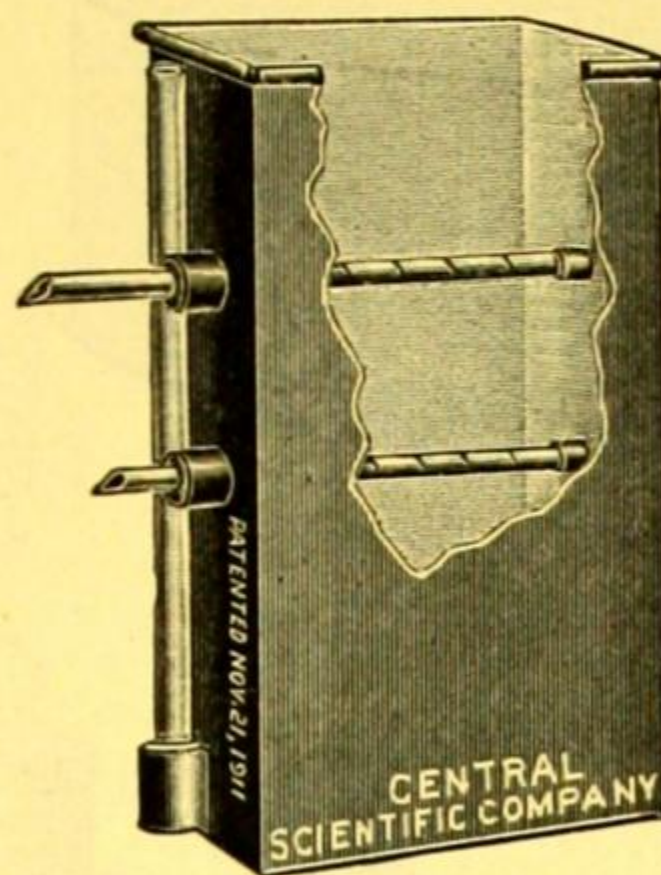
12256. **COMPACTING MACHINE**, designed for obtaining uniform compaction of soils in tubes 18 inches or less in length and four inches or less in diameter. It consists of two uprights having sockets at their lower ends for attachment to the floor and a cross bar with wall attachments at their upper ends. A cross bar fastened rigidly to these uprights carries a rotating tube socket or holder which is rotated by means of a crank. Twice during each revolution the tube is raised to the height of $\frac{1}{4}$ -inch by means of inclined surfaces under the tube holder, and automatically dropped, which process jars the soil into position. A small propeller is attached to the end of the rod extending down from the sliding cross bar. This propeller is placed at the bottom of the tube to be filled and soil then poured into the tube. Twice during each revolution it drops with the soil tube, thus striking a definite number of blows on the soil column as it rises.

This compactor is built to compact soils to approximately the same condition in which they are found in the fields and to give uniform compaction for comparative tests. It is simple in principle and does its work quickly and easily. With two propellers (one for 2-inch tubes and the other for 4-inch tubes), weight holder, and weights. 35.00

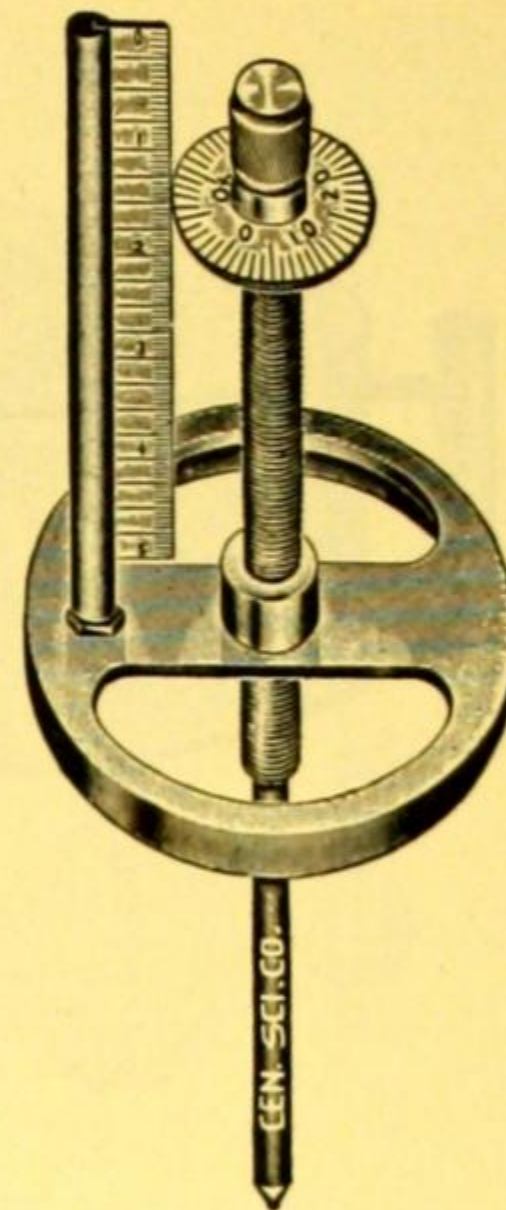
12258. **COMPACTOR, Spring Board**, necessary for compacting soils in glass tubes. Base of wood 8x24 inches; spring board firmly fastened to base at one end; massive slip-weight slides on nickel-plated rod. A very substantial and well-finished piece 9.00



No. 12262.



No. 12272.



No. 12276.

12262. **CONDUCTIVITY APPARATUS**, for determining the thermal conductivity of soils. This design has been modified from the original design in use at the University of Illinois Soils Laboratory. A galvanized iron soil tray, 16x4x5 inches, has at one end a water-tight boiling tank, 4x4x5 inches. Attached to this tank is a heating coil, as shown in the illustration,* by which the water in the tank can be kept at the boiling point indefinitely. By this method of heating, the errors present in the old apparatus due to direct heating from the flame are entirely avoided. The boiling tank is provided with tubulatures for thermometer and for reflux condenser which may be used if desired. Complete as illustrated..... \$9.50

For **CONDUCTIVITY BRIDGE**, see No. 12400.

DISHES, Moisture, see general heading **Dishes**.

12272. **DRAINAGE AND WATER TABLE APPARATUS**, Graham & McCall's, designed to show the behavior of capillary and free water in the soil, and the principles involved in the proper construction of a barnyard to prevent loss of plant food; of copper, 3x6x12 inches high, with a solid bottom to represent hard clay or stone. Through the vessel are two brass tubes, sawed transversely, which communicate with the outside, representing tile drains at different depths. A standpipe shows the height of free water inside the vessel.

To operate, fill the vessel with soil and pour on water at regular intervals, giving it time to soak into the soil. The water, instead of coming out at the tubes, will pass downward through the soil until the solid bottom is reached, when a water-table of free water will be formed at a height indicated by the free water in the glass standpipe. When the free water has risen to the first opening it will pass outside the vessel, thus proving that a tile drain placed as low as soil conditions will permit removes free water before one placed not so deep.

Some Things Which the Apparatus Will Show:

Tile drains do not remove capillary water. A deep drain removes the first water.

No water is removed until the soil at the drain line is beyond the point of saturation.

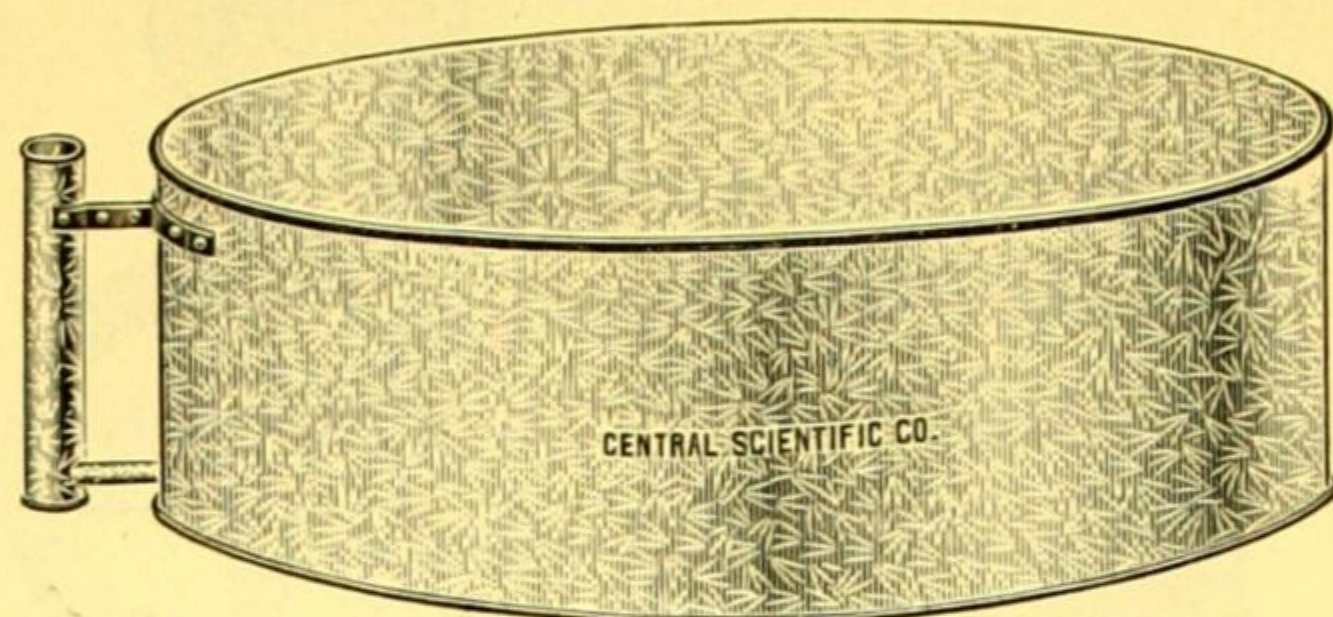
The volume of soil available for plant food is greater in a drained soil.

The volume of soil retaining capillary water is greater where the drains are deep.

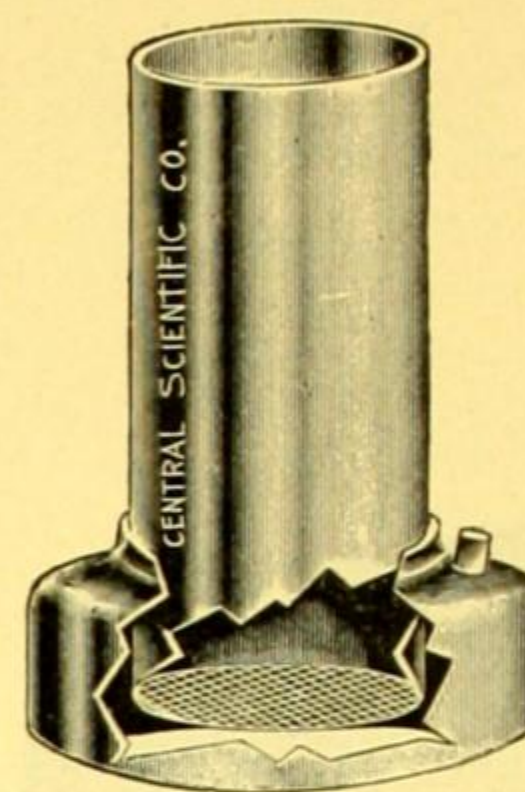
Plant food would not be wasted by leaching from a barnyard having a tight floor of clay or cement and some kind of retaining wall around the outside..... 12.00

DRYING OVENS, see general heading **Ovens**.

12276. **EVAPORATION GAGE**, micrometer screw form, for measuring rate of evaporation, as described in Bigelow's "Manual for Observers in Climatology and Evaporation" (U. S. Weather Bureau No. 409). A micrometer screw is mounted on a cap suitable for supporting it on the top of a still well 3 inches in diameter. The screw proper is 5 inches long with 20 threads to the inch. The micrometer head is graduated in 50 divisions so that readings may be taken to 1/1000 of an inch. For convenience in reading a linear scale graduated in 20ths of inches is provided. The total distance from the head to the end of the pointer, which is of non-corrosive material, is 12 inches. The pointer may be unscrewed and a hook screwed in its place, thus making the instrument serve as a hook gage. Complete as described, with pointer and hook 15.00



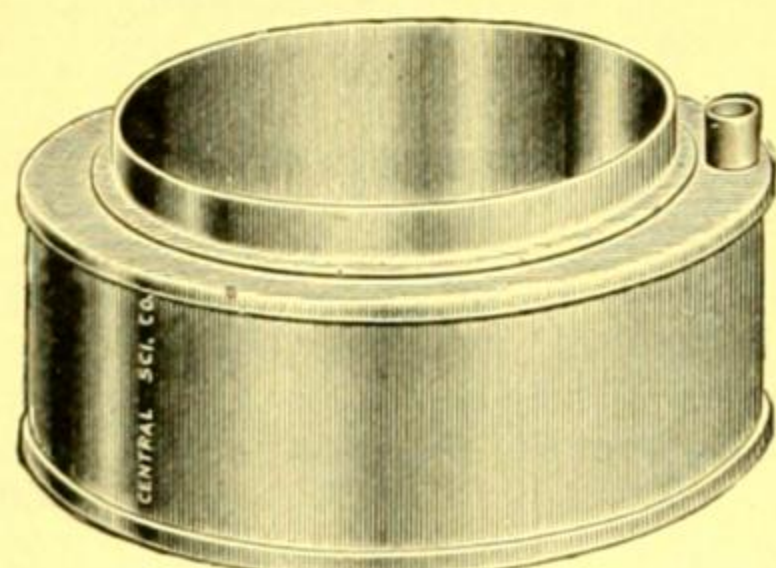
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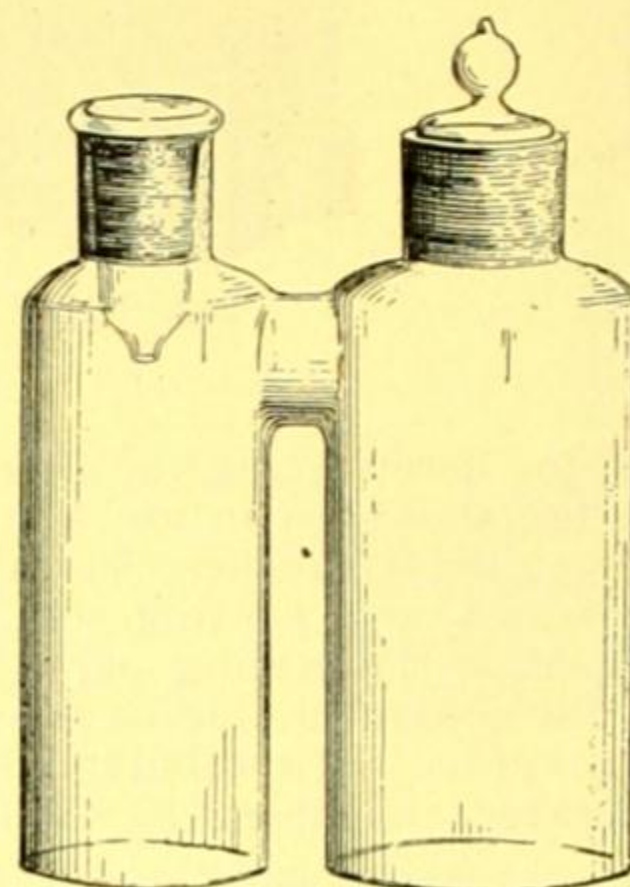
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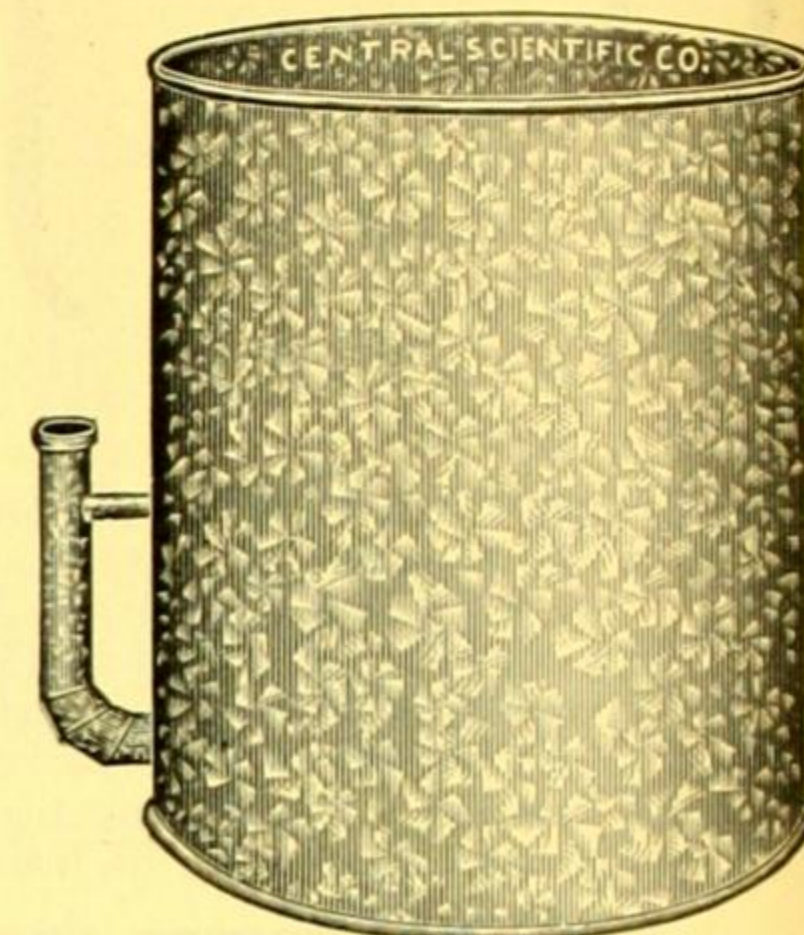
No. 12298.



No. 12286.



No. 12290.



No. 12302.

12278. **EVAPORATION TANK** for use with No. 12276 Evaporation Gage, of heavy galvanized iron 6 feet in diameter by 2 feet deep. A still well 3 inches in diameter is firmly attached to one side of the tank and connected with the tank at the bottom by a galvanized pipe of sufficient size to allow free flow of water between the tank and still well..... \$75.00

Note.—Tanks of different dimensions can be furnished if desired.

12282. **EVAPORIMETER**, for determining the amount of water evaporated from the surface of various soils in a given time; for determining the effect on evaporation produced by different fertilizers, and different methods of cultivation. It consists of a brass tube 4 inches in diameter and 9 inches long having a perforated metal bottom to allow free ingress of water. This tube fits into a water-tight spun brass base.

In operation the tube is filled with soil which is compacted by means of the Soil Compacting Machine (No. 12256). It is then placed in position in the base. Water of known weight is placed in the base whence it passes through the perforated bottom of the tube to the soil and is evaporated from its surface.

The apparatus is entirely of brass, durably made, highly polished and lacquered..... 5.50

12286. **EVAPORIMETER**, for finding the co-efficient of evaporation from soils. The soil container is of copper with brass bottom perforated with one millimeter circular openings. This container is placed in a copper water jacket 3x8 inches 4.50

FILTERS, Soil, see general heading **Filtering Apparatus**.

FURNACES, Muffle, see general heading **Furnaces**.

12290. **LIMESTONE TESTER**, Hoskins', for determining the purity of limestone. The outfit consists of two glass vessels joined together, one for holding the limestone sample, the other for the charge of acid. The apparatus is light and easily weighed. (See Bulletin No. 194 of the University of Illinois Agricultural Experiment Station) 3.50

For other **LIMESTONE TESTERS**, see **Carbon Dioxide Determination Apparatus**.

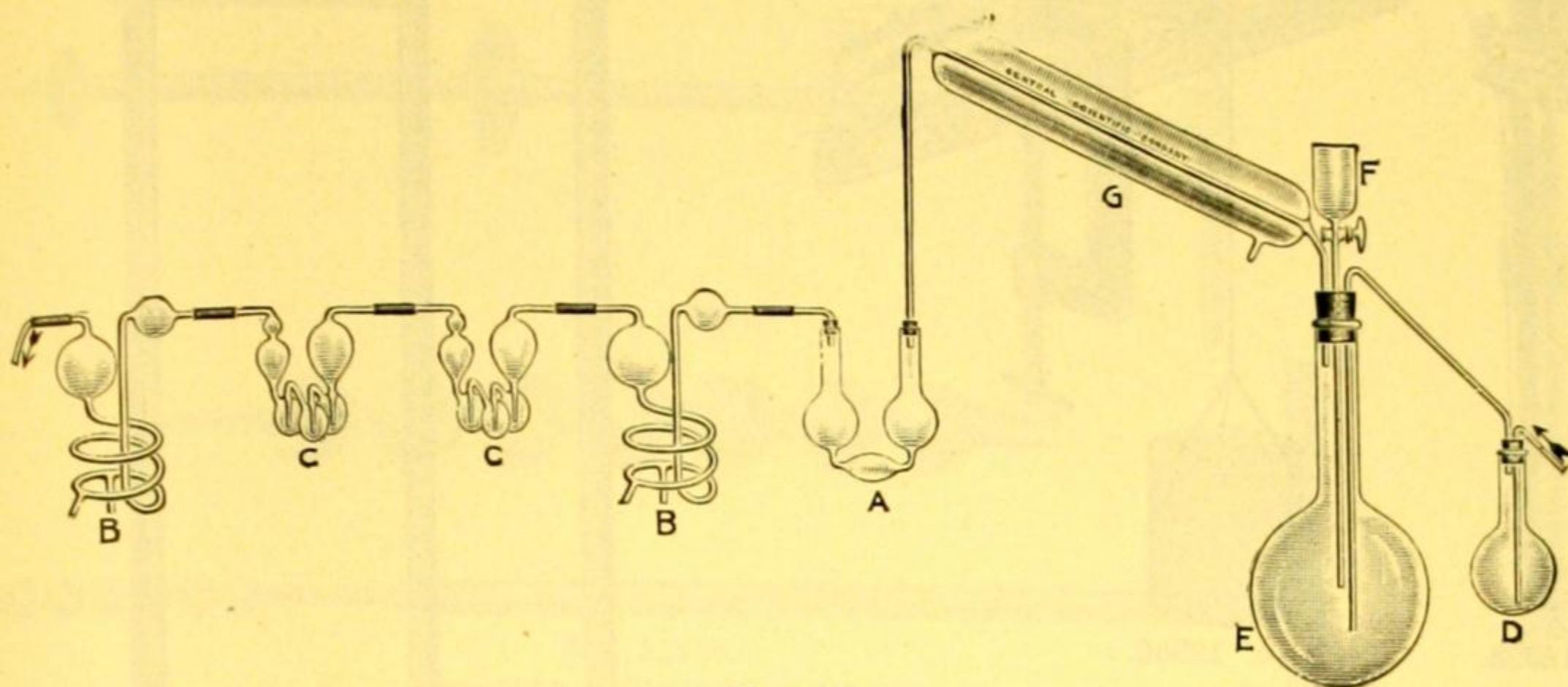
MICROSCOPES, see general heading **Microscopes**.

MILLS, Grinding, see **Crushing and Grinding Apparatus**.

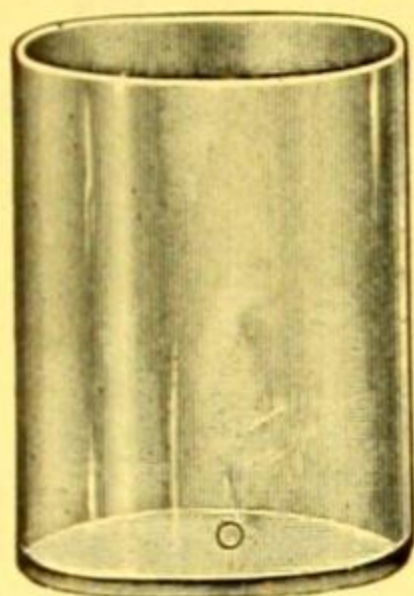
MOISTURE DISHES, see general headings **Boxes, Dishes**.

12298. **MULCH CYLINDER**, McCall's, for determining the effect of mulches upon the rate of evaporation from soils. Design as illustrated; of galvanized iron, 19 inches high; approximate diameter at top 4 inches; at bottom 8 inches..... 4.00

12302. **MULCH CYLINDER**, Stevenson & Schaub's, of galvanized iron 11 inches in diameter by 13 inches high, with water supply tube..... 3.25



No. 12308.



No. 12314.



No. 12316.

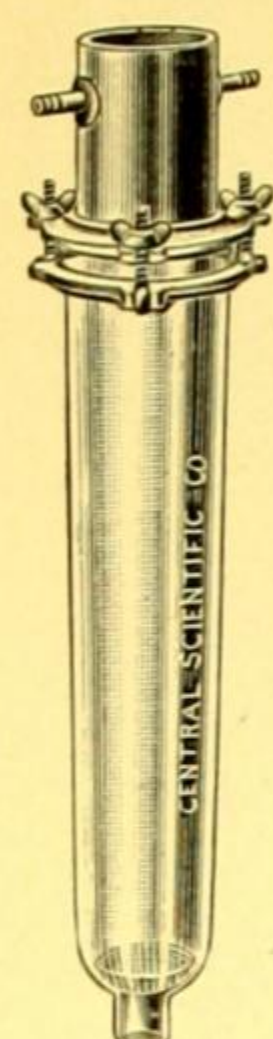


No. 12318.

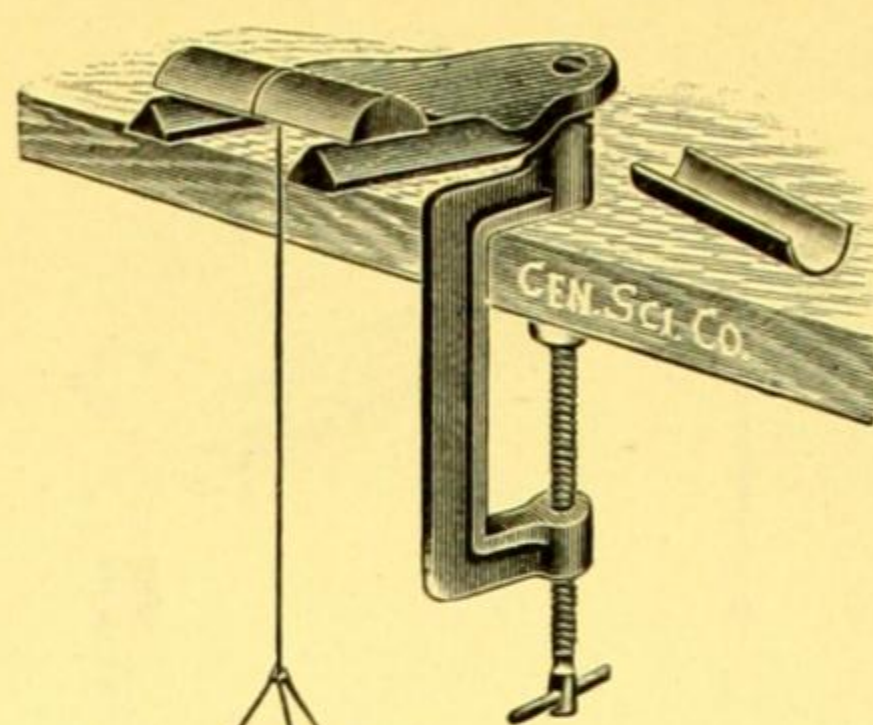
NITROGEN DETERMINATION APPARATUS, see general heading **Nitrogen Determination Apparatus**.

12308. **ORGANIC MATTER DETERMINATION APPARATUS**, for determination of organic matter in soils by the wet combustion method. Consists of two flasks, two Mohr-Geissler Potash Bulbs, one Peligot Tube, two Winkler's Spiral Potash Bulbs, Condenser, Dropping Funnel, rubber stoppers and connecting tubes. (See Bulletin 24, U. S. Bureau of Soils)..... \$13.00
2318. Potash Tube, Peligot (A)..... .40
- 10938A. Potash Bulb, Winkler's, 100 mm (B)..... 2.00
10916. Potash Bulb, Mohr-Geissler (C)..... 1.50
- 5550B. Flask, Potassium Hydrate, 200cc (D)..... .22
- 5550C. Flask, Round Bottom, 300 cc (E)..... .28
- 6160B. Funnel, Separatory, 60 cc (F)..... 1.45
- 3224C. Condenser, 15 inch (G)..... 1.40
12314. **ORGANIC MATTER JAR**. A 1-gallon glass jar provided with a round hole for drainage, 1 cm in diameter, located 1 cm above the bottom 1.15
12316. **PAN**, of metal, water tight, $4\frac{1}{4} \times 4\frac{1}{4} \times 1\frac{1}{2}$ inches. For use in Drying Ovens..... .30
12317. **PAN**, of zinc, $6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{5}{8}$ in. These pans are water tight and will be found convenient for use in drying ovens..... .35
12318. **PAN or BOX**, of zinc, 4x4x4 inches, for volume-weight experiments..... .80

SAMPLE CANS OR BOXES, see general heading **Boxes**.



No. 12328.



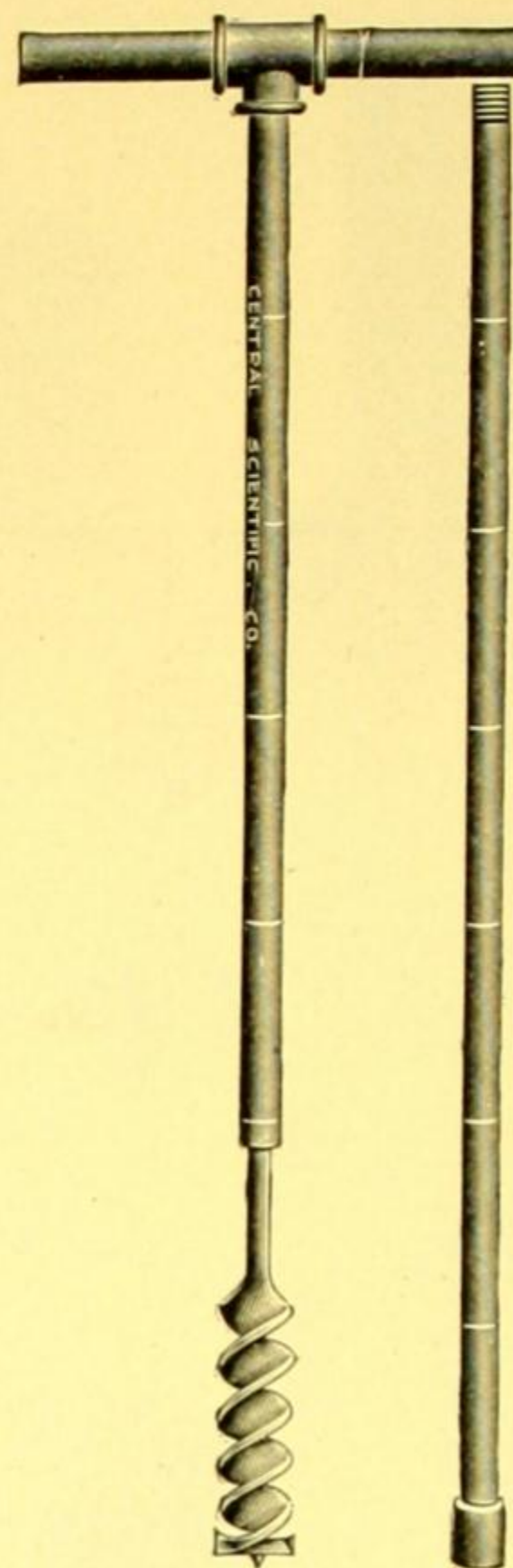
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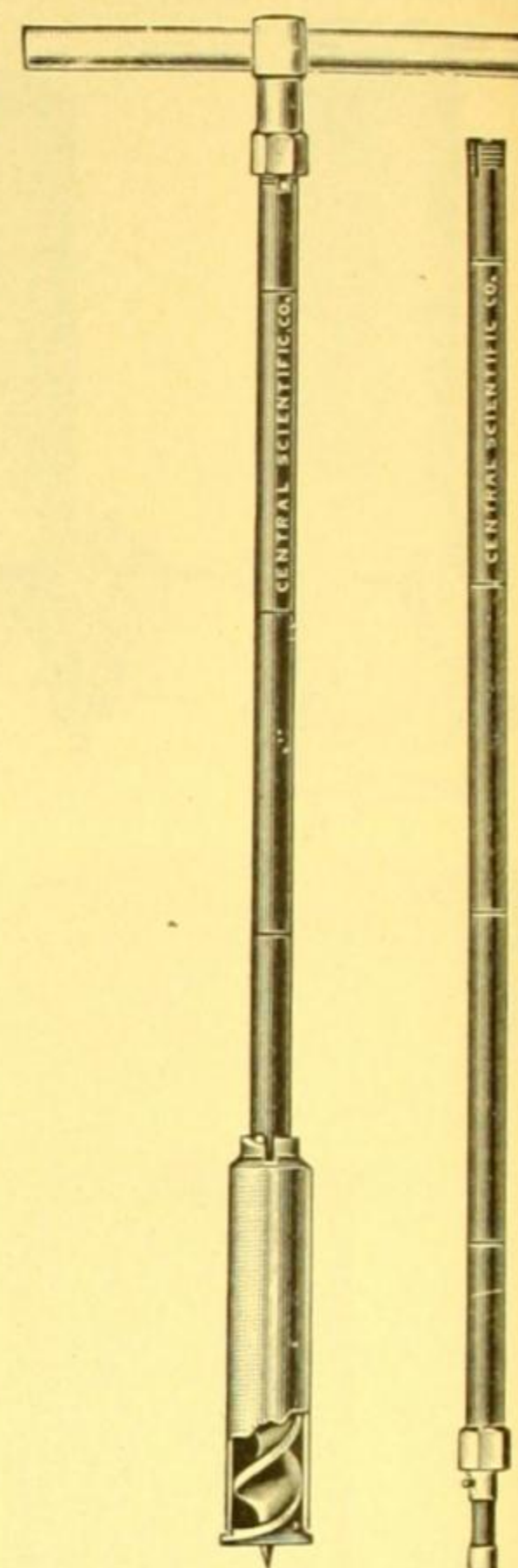
No. 12332.



No. 12338.



Nos. 12344-5.

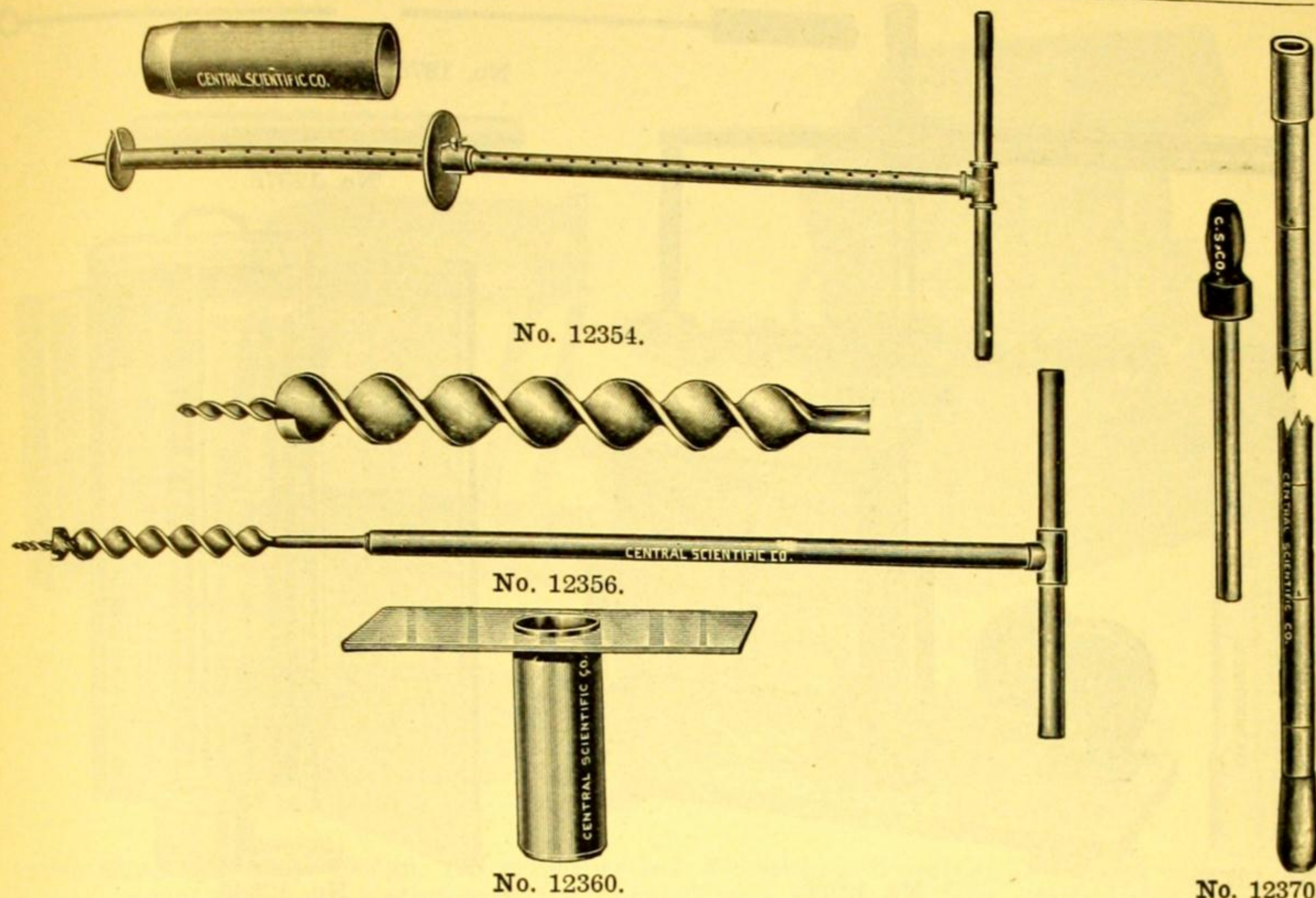


No. 12350. No. 12351.

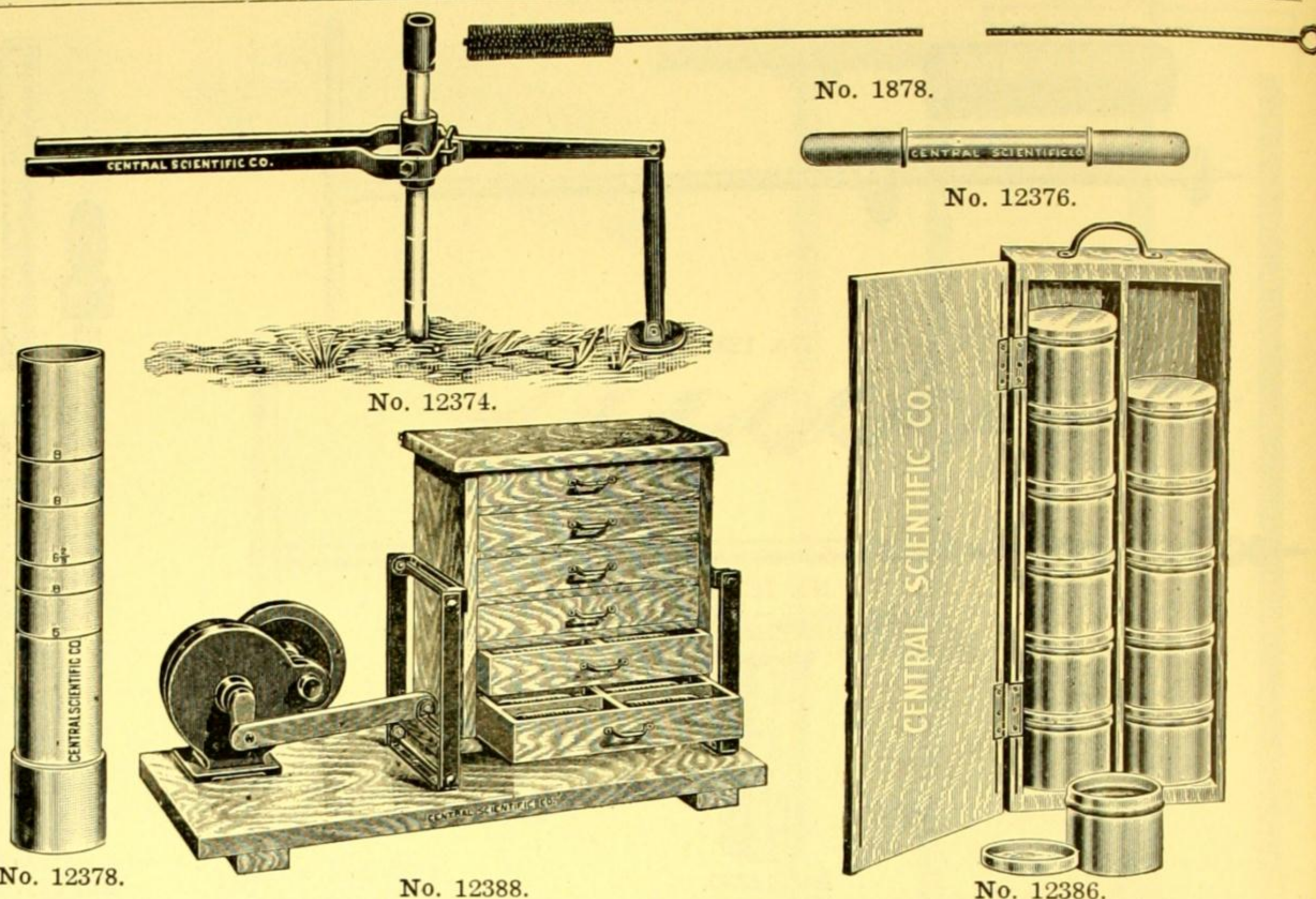
12328. **PERCOLATION APPARATUS**, McCall's, for determining percolation of water through soils. Glass percolator, $1\frac{1}{2}$ pint, with brass extension having lateral tubes. Complete with rubber gasket, copper gauze, etc. \$7.00
- PERCOLATORS**, see general heading **Percolators**.
12332. **PESTLE**, Rubber, for preparing soils for analysis; 7 inches long, wood handle with rubber tip25
12336. **PLASTICITY APPARATUS**, for determining the effects of lime on plastic soils. Consists of a clamp with two knife edges about 4 inches apart, across which the briquet to be tested is placed for breaking, a heavy canvas bag for holding weights and shot and one No. 12337 Mold, 5 inches long, 1 inch wide and $\frac{3}{4}$ inch deep, as illustrated. For those who wish a mold of more accurate dimensions, the purchase of No. 12338 Mold is recommended. (This design has been developed from the original in use at the University of Illinois, in co-operation with the Soil Physics staff of the University) 3.50
12337. **Mold** only of No. 12336.25
12338. **MOLD**, improved form, for No. 12336, as suggested by A. F. Gustafson of the University of Illinois. Of cast brass, accurately milled to shape. All molds are therefore identical and always occupy the same position on the table, so that the briquets of soil obtained are accurate and uniform in shape. Inside cross section $\frac{1}{2}$ square inch, length, 5 inches.... 1.75

SOIL SAMPLING APPARATUS

12344. **SOIL AUGER**, with screw point, for obtaining soil samples. Length 36 inches with graduations every 6 inches; handle detachable; steel cutting edge $1\frac{1}{2}$ inches in diameter. The length may be increased to 72 inches by the insertion of No. 12345 Extension. The screw point permits its use in stumps and in hard soil. Complete with handle but without extension..... 4.00
12345. **Extension** of 36 inches for use with No. 12344 1.00
12350. **SOIL AUGER**, with Sleeve, for use in dry soils. This Auger is of improved form with stem and handle of smooth finished steel. The handle is attached by means of a lock nut of new design which entirely does away with the loosening and tightening up at the joint which has caused so much difficulty in the earlier types of Soil Augers. This Auger is provided with a steel sleeve which fits over the auger bit, resting on a projection at the lower end so that the diameter of the cutting edges is larger than the outside diameter of the sleeve. This sleeve is held firmly in position at the upper end by an ingenious locking device and serves to hold in position the dry soil which otherwise would not cling to the Auger when removed from the ground. 2 feet long, graduated every 6 inches. Complete with sleeve and handle..... 15.00
12351. **Extension**, for use with No. 12350 Soil Auger. Complete with lock nut. Exactly 24 inches long and graduated every 6 inches. 4.50



12354. **SOIL AUGER, Nebraska Design**, designed for general work in soil investigation; especially adapted to work where samples at exact depths are desired, since with this instrument it is possible to secure samples of soil one inch in thickness to a total depth of two feet. This type of auger has been used with satisfactory results by the Nebraska Agricultural Experiment Station in securing samples of soil for chemical analysis and soil moisture studies. The auger is also well adapted for use in making determinations of the apparent specific gravity of soils under field conditions, since a definite volume of soil may be removed without the necessity of digging around a tube and cutting the soil off even with the lower edge. In use the auxiliary tube is driven into the soil to such a depth that when the auger blade is just resting on the surface of the soil, the adjustable gage, set in the first notch on the auger stem, rests on the top of the tube. The gage is then raised to the next notch and the auger turned until the gage again comes in contact with the top of the tube, or, in other words, has removed one inch of soil, since the notches are one inch apart. In this manner, a sample of soil from each inch may be obtained to a depth of 2 feet. Complete with auxiliary tube \$12.50
12356. **SOIL AUGER, Pugh's**, according to Dupont specifications. This Auger is especially designed for use in hard ground, and is the best tool on the market for penetrating the hard pan. It is hand-made out of special steel, and actual tests made in all parts of the world have proved that one Pugh will outwear and outbore a dozen or more of any other make. Useful for soil sampling, tree planting, ditching, drainage and other earth boring where deep holes are required, or where the ground is hard. With extensions it can be lengthened so as to reach to any desired depth; it is used very extensively for prospecting or for well boring, as well as for agricultural work. Length, 4½ feet; weight, 10 to 12 pounds; bit, 1½ inches in diameter; complete with handle 18 to 21 inches long, but without extension..... 9.75
12357. **Extension for No. 12356 Soil Auger**. Length, 3 feet..... 2.20
12360. **Foot Plate**, for use with any Soil Auger 2 inches or less in diameter to prevent the crumbling away of the soil around the edge of the hole. Consists of a steel tube slightly over 2 inches in diameter provided at the upper end with a steel plate about 4.5x10 inches. The tube is driven into the ground before the sampling hole is started and the Plate makes a convenient rest for the feet during the entire operation of removing samples..... 4.50
12370. **SOIL SAMPLING TUBE, King's**. Tube of brass, 5 feet long, graduated every 6 inches. Cutting head of steel with area of opening one-tenth millionth of an acre. Steel collar at top to receive blows of hammer shown in illustration. This hammer is of cast iron, weighing 8 pounds, and is of suitable shape to be held easily in the hand. To obtain soil samples the tube is driven into the ground to the desired depth by means of the hammer. A column of soil is thus forced up into the tube from which it is jarred after removal from the ground. The outside of the cutter being larger than the tube allows it to be drawn from the ground more easily. If, however, the tube is not withdrawn from the ground with sufficient readiness, No. 12374 Tube Hoist should be used. 14.00
- With Hammer

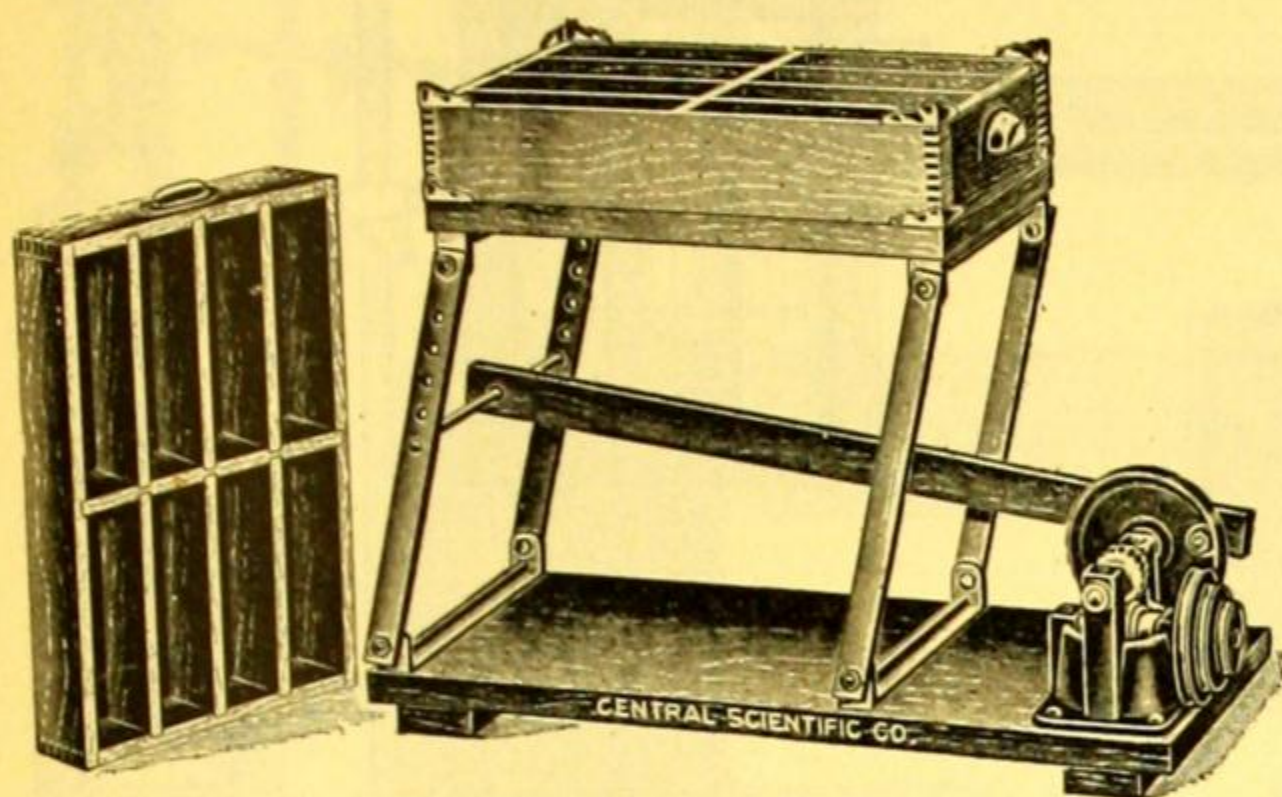


No. 12378.

No. 12388.

No. 12386.

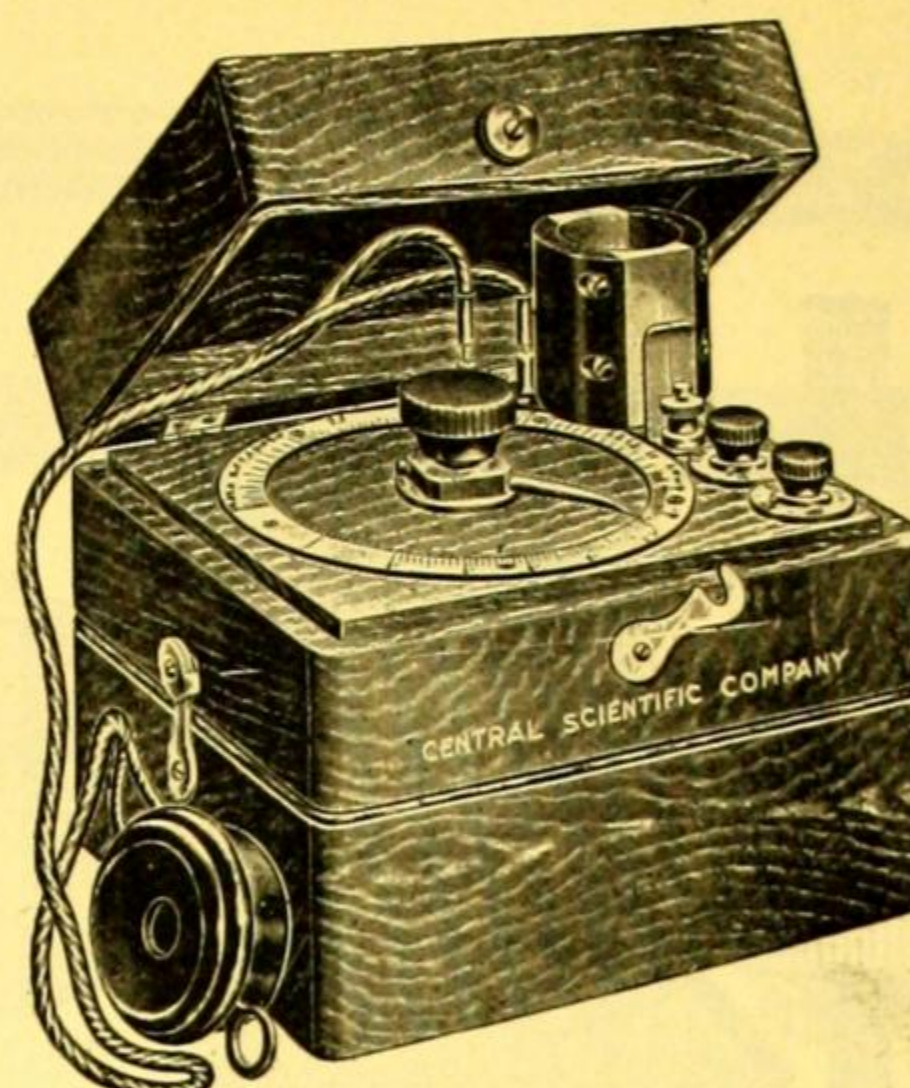
1878. **SAMPLING TUBE BRUSH**, for cleaning No. 12370 Soil Sampling Tube. Bristle brush, with strong wire handle. Total length, 65 inches \$0.20
12374. **SOIL SAMPLING TUBE HOIST**. This contrivance will fill the need for some device for removing Soil Sampling Tubes from the ground. Movement is imparted upward on the handle and, the leverage being ample, no great effort is needed to remove tubes from the most solid soils. Without sampling tube..... 8.75
12376. **SOIL SAMPLING TUBE**, Whitney's, especially useful for obtaining samples for determination of moisture content and nitrifying power of soils; a brass tube 9 inches long, sharpened at one end and with a mark 6 inches from that end, provided with rubber caps for closing each end air tight..... 1.25
12378. **SOIL SAMPLER**, Bacteriologist's, after specifications by H. A. Noyes of the Purdue University Agricultural Experiment Station. This sampler is a brass cylinder 11 inches long by 2 inches in diameter, with an especially constructed cutting edge. The end having the cutting edge is furnished with a tight fitting brass cap 2 inches in height. When the upper end is plugged with absorbent cotton, the sampler is ready for sterilization. The sampler is easy to sterilize, easily kept clean, easy to use, and durable, and hence will be found valuable in bacteriological work. This apparatus will (1) sample accurately soil subjected to any system of management; (2) not interfere with the field conditions existing where the sample is taken, thus making future samples comparable; (3) give a representative sample of soil; and (4) keep the sample practically under field conditions until analyzed, since the tube itself acts as container for the sample. Graduated as shown in the illustration, with directions for use 3.00
12379. **Driving Head**, of cast iron, for use with No. 12378 Soil Sampler..... .30
12386. **SAMPLE CARRYING OUTFIT**. The inconvenience of cumbersome fruit jars and soil bags is done away with in the design illustrated. A neatly finished carrying case, with door and handle, holding one dozen seamless tin cans of one pint capacity, with tight-fitting lids. (See No. 1828.) The suitability of these cans for drying pans makes this an economical outfit, since special pans for the drying oven are not needed. Complete with one dozen cans..... 5.25
1828. **Soil Sample Cans, Seamless Tin**, same style as used in No. 12386.
- | | | | | | | | |
|------------------|-----|-----|-----|-----|------|------|------|
| Capacity, ounces | 1/2 | 1 | 2 | 4 | 8 | 16 | 24 |
| Per dozen | .25 | .30 | .45 | .65 | 1.00 | 1.55 | 2.05 |
- For other **SOIL SAMPLE CANS AND BOXES**, see **Boxes**.
SOIL SAMPLE JARS, see **Jars**.
SOIL SCOOPS, see general heading **Scoops**.
12388. **SHAKER**, Chest of Drawers Design, for preparing soils for mechanical analysis. Essentially as described in Bulletin 84 of the Bureau of Soils, but with hinge mounting similar to that described under No. 12060 Shaker. The gearing is of the enclosed type and is arranged to be belted to any 1/4 h. p. motor having V-groove pulley. The chest is substantially made of hardwood nicely finished, and has six drawers each with eight compartments for holding No. 12391 Sterilizing Bottles. Complete on a massive hardwood base with forty-eight No. 12391 Sterilizing Bottles, but without motor 102.40
- For **MOTORS** for use with No. 12388, see general heading **Electrical Instruments**.



No. 12390.



No. 12391.



No. 12400.

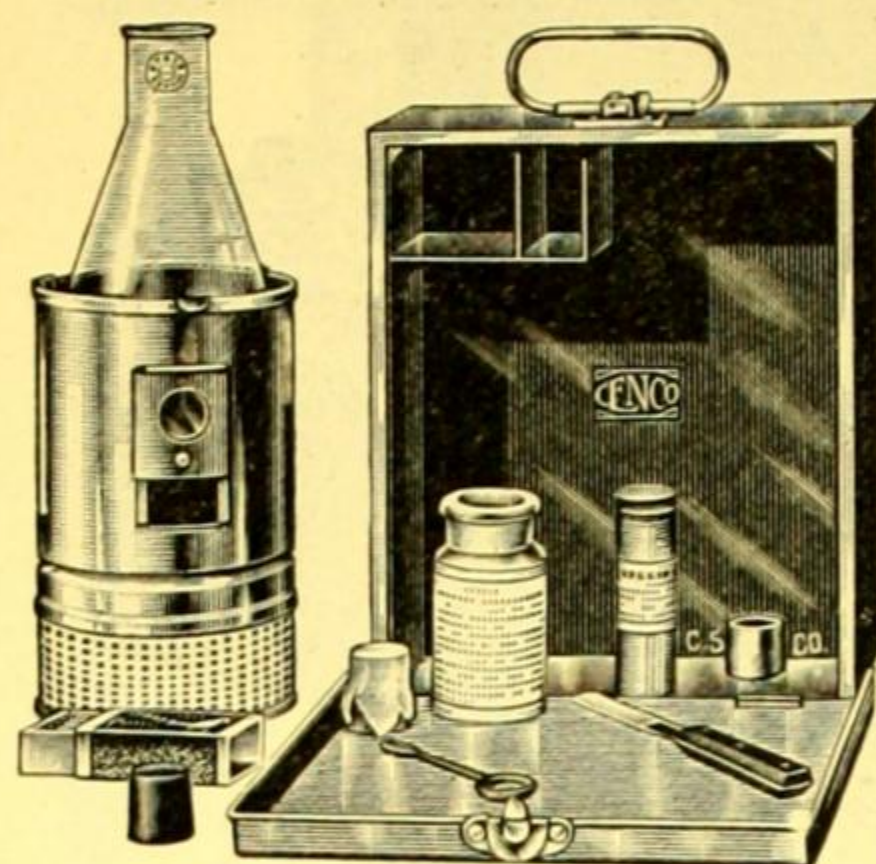


No. 12394.

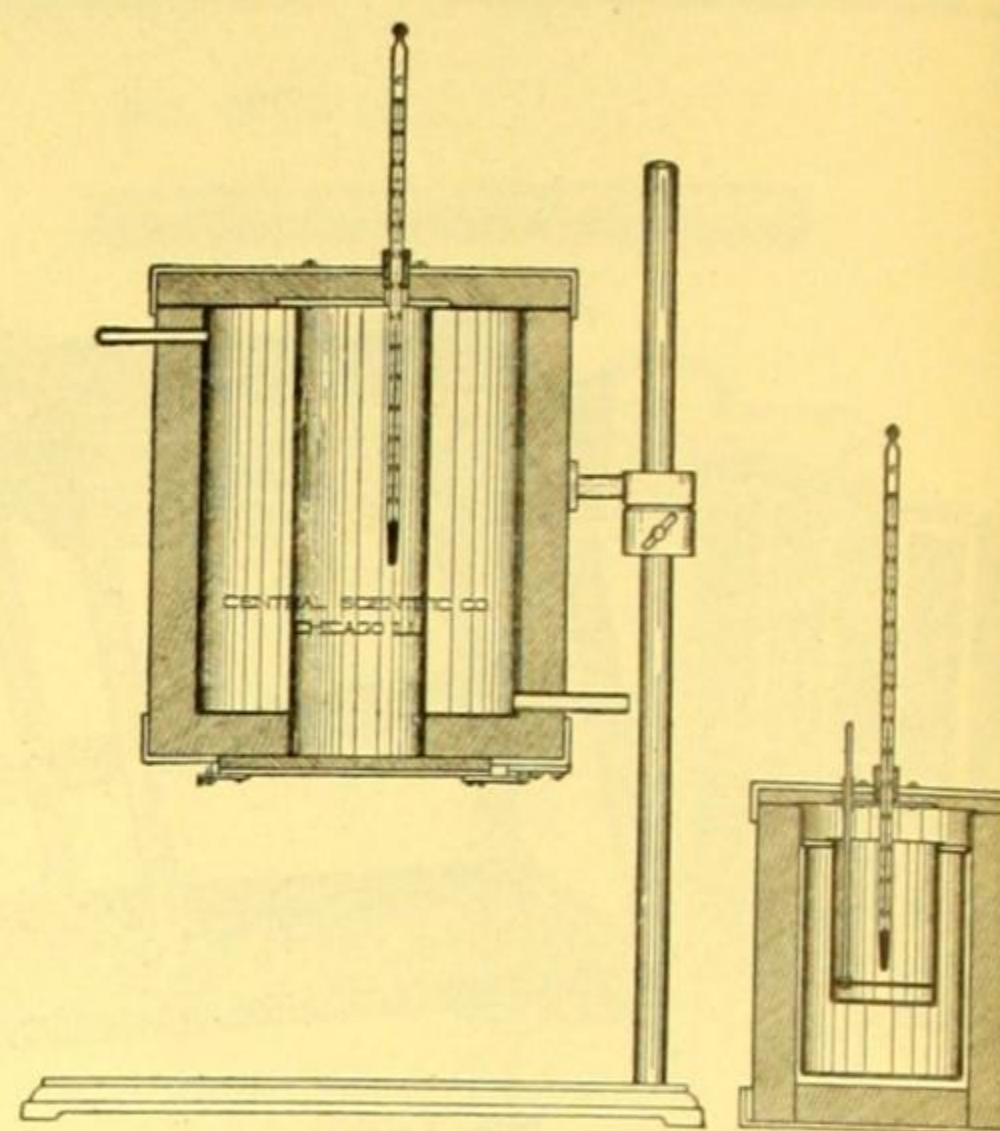
12390. **SHAKER, Tray Design**, for preparing soils for mechanical analysis. Two trays with compartments for eight bottles each are mounted on a wooden platform attached to a substantial wooden base by four hinged metal supports. The shaking movement is imparted through a worm gear mounted on the same base. Sufficient power will be furnished by a $\frac{1}{8}$ h. p. motor. The trays are both made removable for convenience in handling and filling. Complete with sixteen No. 12391 Sterilizer Bottles, but **without motor** \$80.75
12391. **Bottles, Sterilizer**, for use in Nos. 12388 and 12390. Capacity, 8 oz. per dozen .60
- SHAKER, Soil Sieve**, see No. 12148.
12394. **SHRINKAGE APPARATUS** for determining the shrinkage of soils, as described in Mosier and Gustafson's "Soil Physics Laboratory Manual," and used at the University of Illinois. This is a tray of brass, 3 inches square at the top, with beveled sides to facilitate removal of the soil sample. In use, a piece of cheese cloth is placed on the bottom of the tray, which is then filled with moist soil. The soil block is then removed from the tray and allowed to dry. The shrinkage in area may readily be determined by measurement.40
- SIEVES for Soil Analysis**, see general heading **Sieves**.

SOIL CONTENT TESTERS

12400. **CONDUCTIVITY BRIDGE**, for determining the soluble salt content of soils; made after designs approved by the U. S. Bureau of Soils.
- The use of this bridge depends on the fact that the electric current is conducted by the salt in solution and that the conductance of the solution or, conversely, its resistance to the passage of the current, is determined largely by its concentration. The magnitude of current that will pass is increased by an increase of salt in solution; or the resistance to the passage of the current decreases with the increase of salt. The instrument is of general utility in measuring the resistances of solutions of soils. It is designed primarily for use as a field instrument, and finds its greatest use in determinations of "alkali" or harmful excess of soluble salts, frequently present in the soils of arid and semiarid areas. In survey work it gives a convenient method for determining in the field the percentage of alkali in a soil, so that the mapping may be carried on concurrently. It is also useful in determining the salt content of irrigation and seepage waters.
- The instrument, by means of which resistances are measured, is a modified form of slide-wire Wheatstone's bridge. In operating the bridge, the cup is filled with the soil saturated with water, and placed in the clips provided for it. The resistance of the cup contents is then read, and from the resistance the amount of soluble salt present determined by reference to the tables given in Bulletin 6, U. S. Bureau of Soils. Complete as described. 275.00
- Note.**—Bridges of the above type made by us have proved satisfactory to and met the requirements of the U. S. Bureau of Soils, Washington, D. C.
- Bridges of this type are used by the Atchison, Topeka & Santa Fe Railway Company for testing the alkali content of their tank water.
12401. **Dry Battery**, complete, as used in No. 12400 Conductivity Bridge. 1.50
12402. **Soil Cup**, extra, for No. 12400. 10.00



No. 12404.



No. F2333.

No. F2334.

12404. **SOIL ACIDITY TESTER**, Truog, devised by Prof. E. Truog of the Department of Agriculture of the University of Wisconsin for determining rapidly in the field the lime requirements of the soil. The principle made use of is that of treating the soil in boiling water with a chemical which releases the acid constituents. The free acid reacts with a neutral sulphide, evolving hydrogen sulphide gas, the presence and amount of which are detected by the intensity of color produced upon a strip of test paper held across the mouth of the boiling flask. No balance or other complicated apparatus is required and the method is so simple that accurate determinations can be made by anyone the first time it is used.

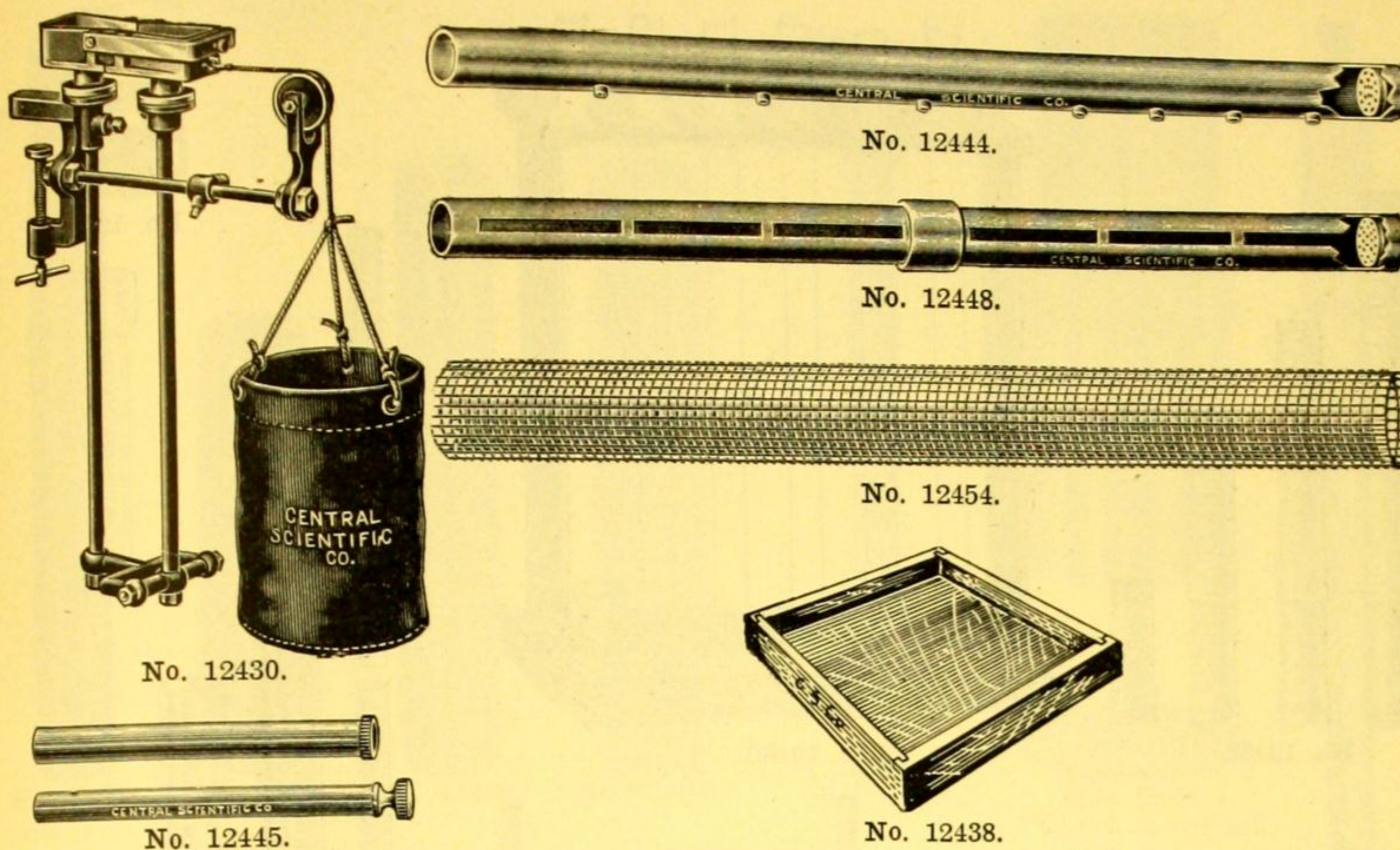
The outfit illustrated above is the **genuine Truog tester**, first made by us under Prof. Truog's supervision, according to specifications furnished by him, and embodying all improvements made by him up to the present time.

The **Truog Soil Acidity Tester** consists of a metal burner of special form, a metal shield and flash holder combined, brass measuring cup, brass measuring spoon, metal spatula, metal container for distilled water, graduated boiling flask, glass bottle of reagents and glass vial of test paper put up by Prof. Truog especially for this outfit, conveniently arranged in a portable metal carrying case, the cover of which, when open, lies flat forming a convenient work table.

Complete as described, with sufficient reagents and test paper for 50 tests, with the author's directions for use, including an accurate color chart and a table of the lime requirements corresponding to the different colors and to the nature of the crop..... \$7.50

EXTRA PARTS FOR No. 12404 TRUOG SOIL ACIDITY TESTER.

- | | |
|--|--------------|
| 12405. Flask, 300 cc capacity, with mark at 100 cc..... | 1.00 |
| 12406. Measuring Cup for soil..... | .30 |
| 12407. Measuring Spoon for reagents..... | .10 |
| 12408. Test Paper, 50 sheets in glass vial..... | per vial .25 |
| 12409. Set of Reagents, sufficient for making 50 tests, consisting of a bottle containing 55 grams of a mixture of barium chloride and zinc sulphide specially prepared, vial of test paper (50 strips)..... | 1.00 |
| 12410. Set of Reagents, one pound bottle, with test paper | 4.25 |
| F2333. SPECIFIC HEAT APPARATUS , modified design after Prof. A. G. McCall, for determining the Specific Heat of Soils; may also be used for determining the specific heat of any substance. Consists of a double-walled heater or steam jacket with large rectangular base and support rod, and a double-walled calorimeter. Both heater and calorimeter are of very substantial construction, and are well insulated. The heating chamber extends through the heater and is closed at both ends with heavy insulated covering. The top cover has two openings, one holds the heater rests on a collar which is clamped to the support rod, so that when the sample has come to a constant temperature the lower cover of the heater can be swung back out of the way and the heater rapidly swung around to a position over the calorimeter. The transfer of the specimen from heater to calorimeter can thus be readily and quickly effected. Heater and calorimeter complete as described, but without thermometers | 35.00 |
| F2334. Calorimeter only of No. F2333 without thermometer | 10.00 |



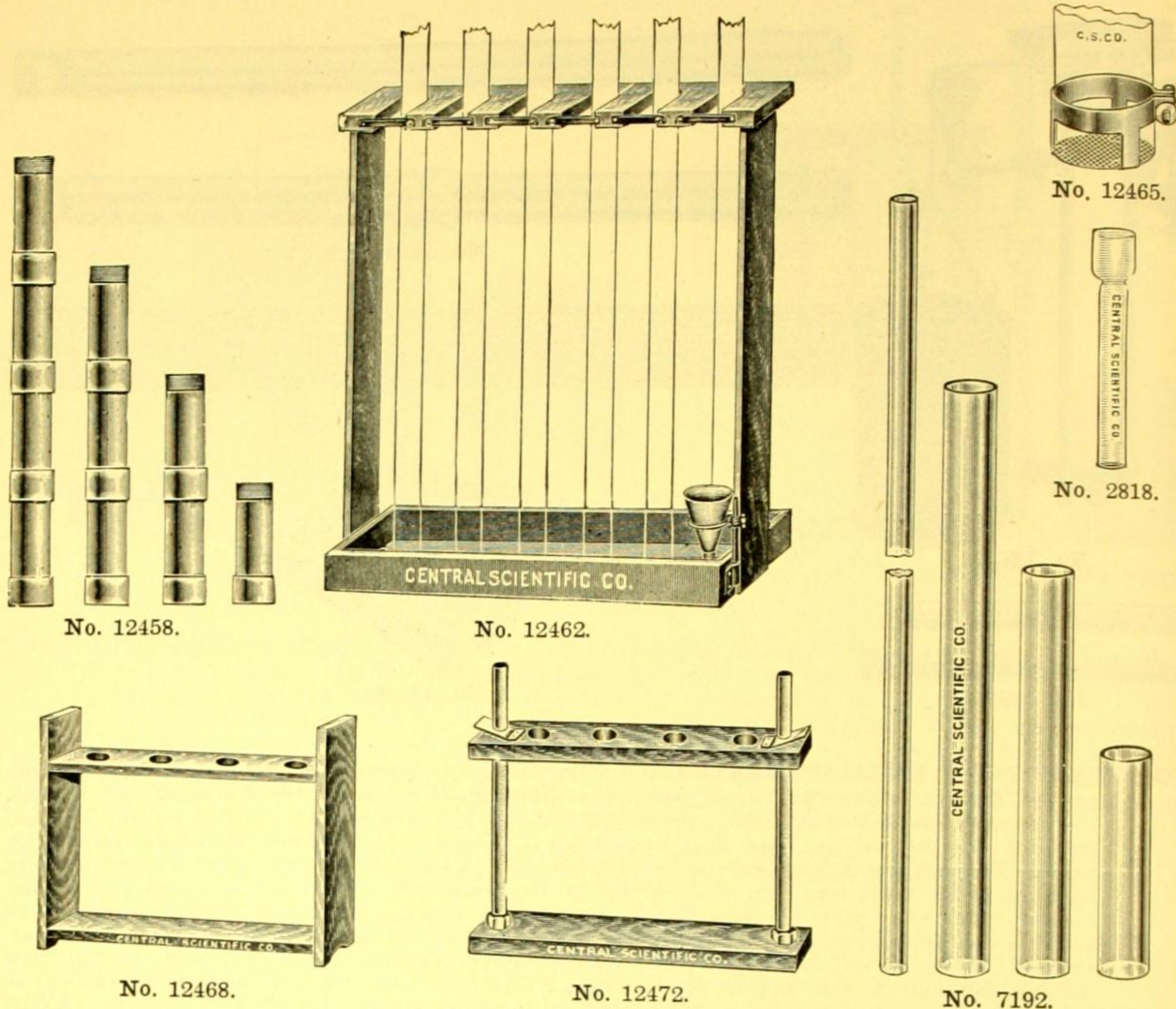
12430. **TENACITY OF SOILS APPARATUS**, for determining the tenacity of moist soils. In this improved design, which was developed from the original in use at the University of Illinois, the inaccuracies due to friction, caused particularly by a collection of dirt on the moving parts of the instrument, have been completely obviated, and constant conditions thereby assured. Two brass soil containers are supported on a hinged frame which in turn is securely clamped to the table top. The soil containers are removable from the frame and are so constructed that they may be immediately replaced in exactly the same relative position. In use, the containers are held firmly together by means of the metal stirrup shown in the illustration; the moist soil is compacted in the containers and smoothed level with the top, thus leaving one square inch section for testing. Weights are now placed in the hanger sufficient to pull the soil apart. Complete, as illustrated, with canvas hanger, but without weights.. \$16.00

THERMOMETERS, Soil, see general heading **Thermometers**.

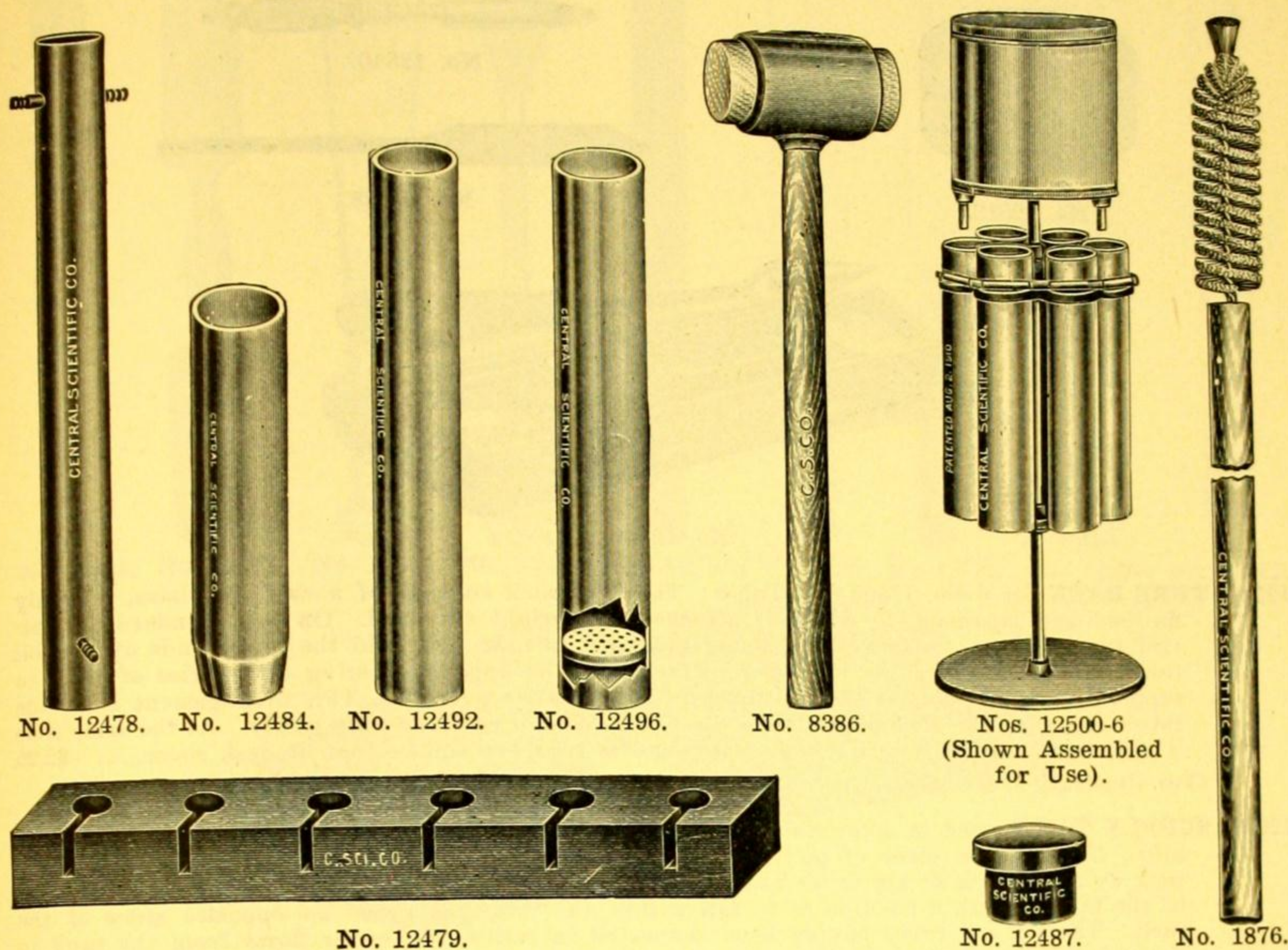
12438. **TRAY, Puddling**, for mixing and working soils. Water tight, waterproofed wooden tray, 25 inches x 25 inches x 2 1/4 inches. Will not warp..... 6.00

TUBES, SOIL, ALL KINDS

12444. **TUBE, Capillarity, McCall**, with side tubes for studying the distribution of moisture in vertical columns of soil; also for determining the lateral movement of capillary moisture. Of brass, 36 inches long by 2 inches in diameter, with perforated bottom and small lateral tubes at definite intervals..... 6.00
12445. **TUBE, Sampling**, for use in obtaining samples from the side openings of No. 12444 Capillarity Tube as suggested by Prof. John A. Slipper of Purdue University. A brass tube with diameter slightly contracted at the sharpened end is provided with a plunger by which the sample of soil may be ejected..... 2.00
12448. **TUBE, Capillarity, McCall**, for determining the rate of the capillary rise of water in soils. Of brass, 36 inches long by 2 inches in diameter, with perforated bottom. Running lengthwise of the tube is a slot fitted with a window of thin celluloid through which the moisture height may be noted..... 4.75
12451. **Celluloid Strip**, 36x3 inches, for No. 12448..... .50
12454. **TUBES, Capillarity**, of celluloid protected by wire gauze. These tubes consist of a cylinder of galvanized iron wire gauze 2 inches in diameter, surrounding a cylinder of thin transparent celluloid formed of a strip of celluloid sufficiently wide to go 1 1/2 times around the tube. These tubes are soil tight, transparent, and durable, and are very satisfactory for studying the distribution of water in capillary rise experiments, since the inner tube may be withdrawn and unrolled, exposing the soil for easy sampling.
- | | | | |
|---------------------|------|------|------|
| | 12 | 24 | 36 |
| Length, inches..... | 1.40 | 2.00 | 2.50 |
| Each..... | | | |



12458. **TUBES, Capillarity, Sectional**, for determining capillary rise of water in soils. These sections are made of heavy brass tubing and are 8 inches long by $1\frac{1}{2}$ inches in diameter. Each section is threaded at both ends to receive brass couplings so that the tubes may be built up to any desired length. The tubes may readily be cleaned, and the breaking of the soil column which causes so much annoyance in long brass and glass tubes is obviated, because the section joints, which are tight enough to prevent evaporation losses from the soil, are loose enough to permit equalization of air pressure inside and outside of tube. (For Bottom Tube, see No. 12459 below.) Per section (with one coupling) \$1.50
12459. **Bottom Tube**, for No. 12458 with perforated bottom. For use as lowest tube of set. 1.50
12462. **Tube Support, Capillarity**, for supporting 2-inch tubes 32 inches long or longer in a vertical position. Will hold six tubes which may be readily removed or put in place. The base is constructed in form of a tray and holds a water-tight zinc tank. A rod and ring at the side of the tray is designed to hold an inverted flask so that the height of the water in the tray may be kept constant. Complete as illustrated, but without flask or tubes. 17.50
7192. **TUBES, Capillarity, Glass.** No. R T V F
 Diameter, inches 2 2 2 1
 Length, inches 8 15 24 60
 Each70 1.20 1.30 .80
12465. **Perforated Bottom** for 2-inch Glass Soil Tubes. May be used with tubes from $1\frac{1}{8}$ inches to $2\frac{1}{8}$ inches in diameter. Clamps firmly to the bottom of the tube, but may readily be removed for changing from one tube to another.30
 For **CLEANING BRUSH**, see No. 1876.
2818. **TUBES, Capillarity, Glass**, student's lamp chimney form. per dozen 2.00
12468. **Support**, of wood, for holding four No. 2818 Capillarity Tubes 2.00
12472. **Support**, for four No. 2818 Capillarity Tubes, more substantial than No. 12468. Base of wood with metal uprights and adjustable shelf for supporting tubes; finely finished. 4.00
- F3355. **TUMBLERS**, for use with No. 2818 Tubes; $\frac{1}{2}$ -pint size each .07
 per dozen .65



For **ORGANIC MATTER TUBES**, see No. 7192 on preceding page.

12478. **TUBE, Percolation of Water**, for determining the rate of percolation of water through soils. Of brass, 18 inches long by 2 inches in diameter, with lateral inlets and drainage tube, and with solid bottom below and perforated bottom above drainage tube..... \$1.60
12479. **Support Block**, for use with No. 12478 Percolation Tube. This block is necessary when several soils are to be compared..... 2.50
- For **Cleaning Brush** for No. 12478 Percolation of Water Tube, see No. 1876.
12484. **TUBE, Specific Gravity**, for determining the apparent specific gravity of surface soils under field conditions. Of steel, 12 inches long by 3 inches outside diameter, with cutting edge 4.00
12487. **Driving Head**, of cast iron, for use with No. 12484 Specific Gravity Tube to prevent battering the upper edge when the tube is driven into the ground..... .60
8386. **Maul** for driving No. 12484 Specific Gravity Tube. Substantially made of iron with hardwood faces. The handle is two feet long, and the Maul is sufficiently heavy for its purpose, without being clumsy..... 1.80
12492. **TUBE, Volume Weight**, for determining volume weight and pore space. Of brass, 12 inches long by 2 inches in diameter, with solid bottom, and crease one inch from the top..... 1.25
12496. **TUBE, Water Holding Capacity**, brass, 12 inches long by 2 inches in diameter, with perforated bottom, 1½ mm perforations, and crease one inch from top..... 1.25
1876. **TUBE BRUSH**, for cleaning soil tubes of 2 inch diameter; has a wooden handle 3 feet long and is provided with a tuft of bristles at the end for reaching the bottom corners of the tube .80
12500. **TUBES, Soil**, so constructed that one style of tube may be used for all experiments. They are made from brass tubing 10 inches long and 2 inches in diameter. A cast brass base, which is corrugated on its upper surface, is soldered into the bottom of the tube. On the lower surface of this casting is a connection for rubber tubing. A brass disk with circular perforations, and somewhat smaller than the inside of the soil tube, is dropped to the bottom of the tube and rests on the corrugated surface of the brass base, allowing free passage of air or water through the tube. The tubes are so constructed that they can be connected in series by means of rubber tubing so that a constant water level may be obtained in all the tubes. Each 1.30



No. 12512.



No. 12540.



No. 12538.



No. 12552.

12502. **TUBE RACK** for 6 No. 12500 Soil Tubes. The tube rack consists of a cast iron base, smoothly finished and japanned, to which is attached an upright standard. On this standard are carried two castings, the lower one being arranged to take and hold the lower ends of the soil tubes by means of lugs on its upper surface, and the upper consisting of a series of rings to support the upper ends of the soil tubes in a concentric position. This arrangement holds the tubes securely, but still allows them to be removed or replaced very easily. At the same time it is compact, the rack and tubes occupying less than one square foot of desk room.... \$2.25

(For illustration, see page 461.)

12506. **SUPPLY TANK**, used in determining the comparative rate of flow of water through various soils. This tank is made of polished brass and rests on the top of the standard of the tube rack by means of a socket in its base. Two short brass tubes extend downward from the base of the tank in such a position as to fall within the two soil tubes on opposite sides of the rack. The six soil tubes having been connected in series, the water flows from the tank to the soil tubes, maintaining a constant water level therein..... 4.00

(For illustration, see page 461.)

12512. **WATER RETENTION CUP**, for determining the maximum water retained by soil. Of brass 2 inches in diameter by $\frac{7}{8}$ inch high, with diaphragm of perforated metal fastened about $\frac{1}{8}$ inch below top. This cup is used in studying the wilting point by means of the direct relationship which exists between the maximum water retained by any soil and the wilting point. (See Hilgard's "Soils," page 209)..... .40

12532. **SOLDER**, Wire Form, half lead and half tin.....Per pound .50

12534. **SOLDER**, Wire Form, with resin center; half lead and half tin. Used for all electrical joints and splices where danger of corrosion must be eliminated. No flux required when using this solder. In 1-pound packages.....Per package 1.00

12538. **SOLDERING COPPER**, $\frac{1}{2}$ lb., with handle..... .50

12540. **SOLDERING COPPERS**, Electric, for either A. C. or D. C. circuits. Tip interchangeable and can be replaced instantly. With cord and plug. In ordering please state exact voltage.

No.	A	B
Length, inches	10	14 $\frac{1}{8}$
Weight, ounces	9	18
Diameter of tip, inches.....	$\frac{1}{2}$	$\frac{7}{8}$
Watts	60	150
Each	8.25	11.50

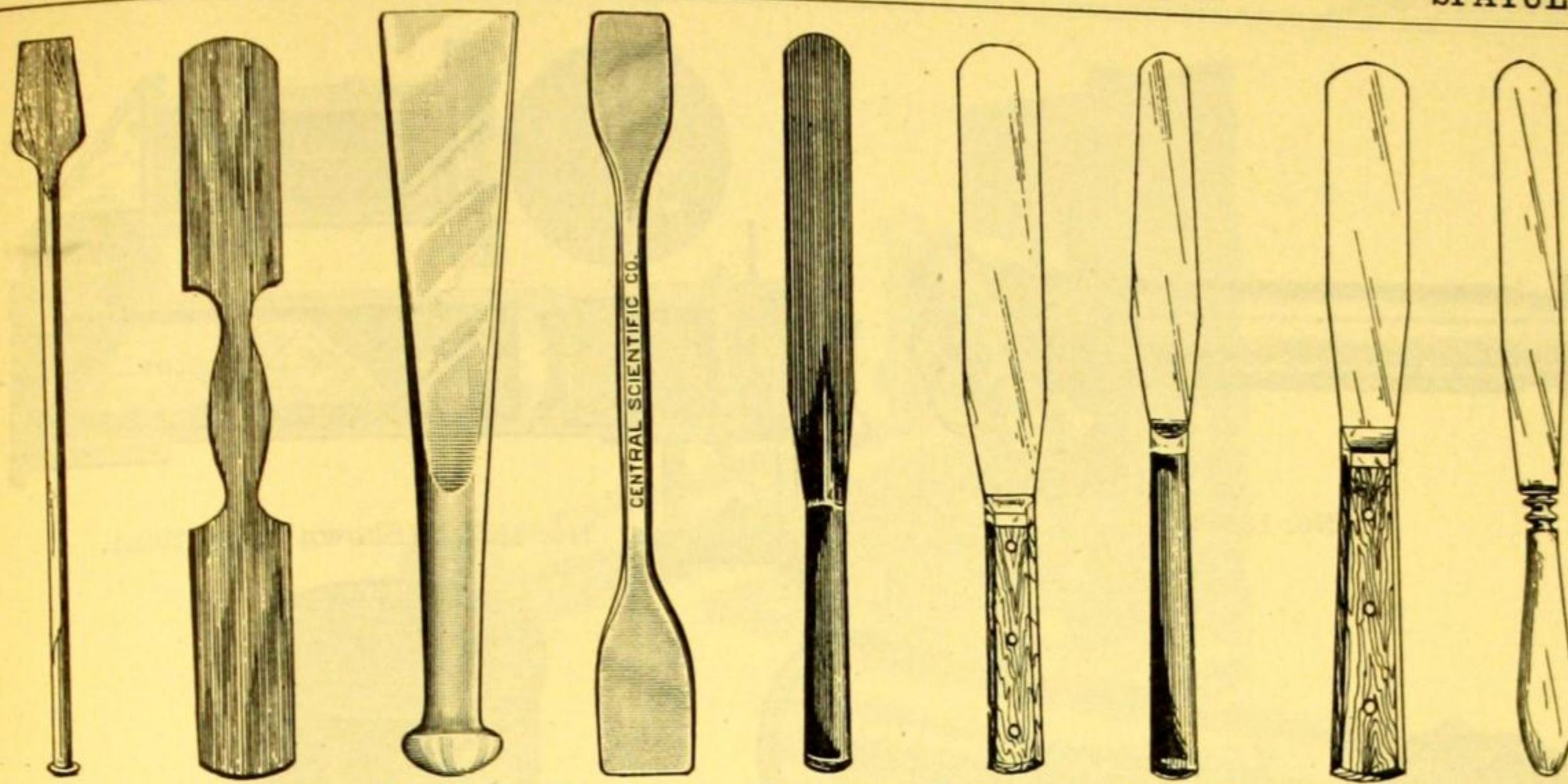
12544. **SOLDERING COPPER**, Jewelers', 1 ounce, high grade, for instrument use..... .45

12548. **SOLDERING PASTE**, easy to apply, non-acid, fumeless, non-corrosive. Especially useful for electrical work. In metal cans.

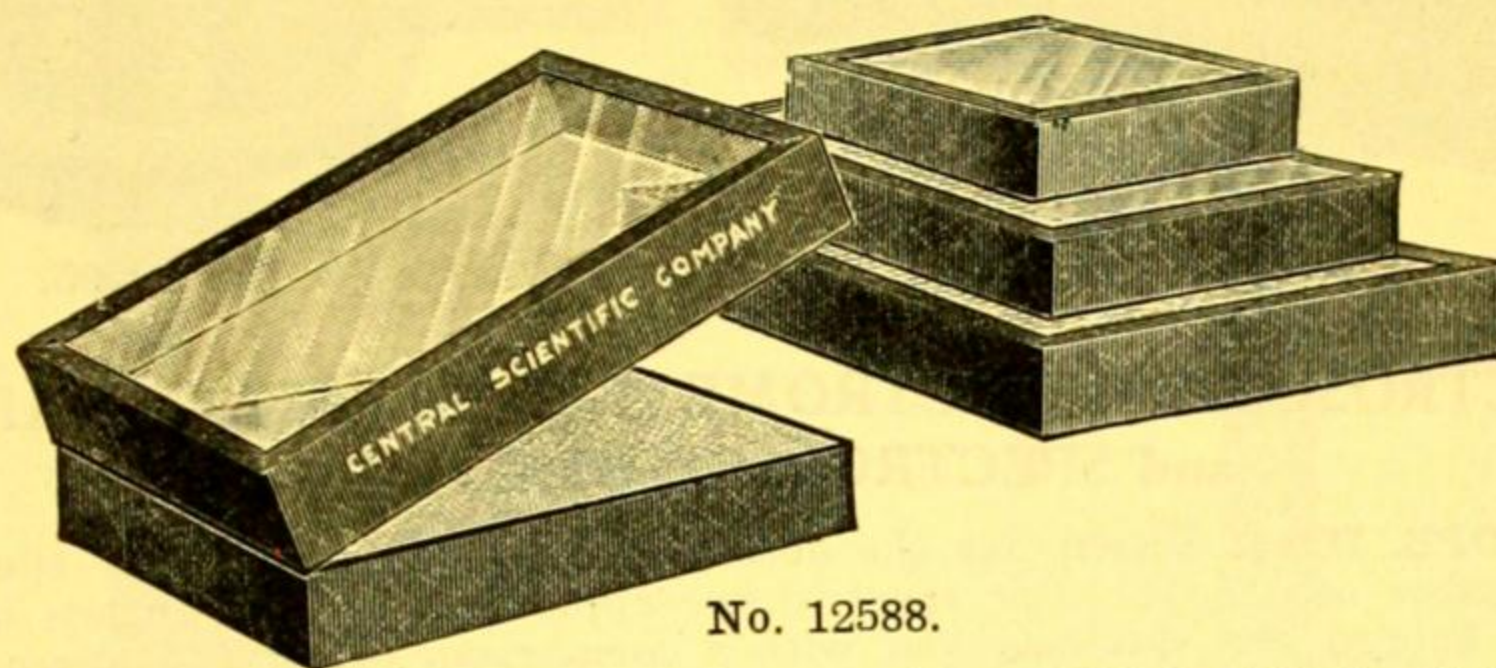
No.	A	B
Size, ounces	2	8
Each	.40	1.20

12552. **SOLDERING OUTFIT**, consisting of a soldering iron, bar of solder, scraper and flux, in a neat wood box60

SOLDERING IRON HEATER, see Burner No. 2114.



No. 12564. No. 12568. No. 12572. No. 12573. No. 12574. No. 12576. No. 12578. No. 12580. No. 12582.



No. 12588.

12564. SPATULA, Glass, 6 inch blade ground on both sides. Width of blade, $\frac{5}{8}$ inches. \$0.25
 12568. SPATULAS, Horn, double, with spatula on each end.

Length, mm	100	125	150	200
Each	.20	.25	.27	.50

SPATULAS, Platinum, see Platinum Ware.

12572. SPATULAS, Porcelain, with paddle at one end, knob at the other, glazed throughout.
 Length, mm 200 310 442
 Each74 1.32 3.18

12573. SPATULAS, Porcelain, double, with spatula at each end.
 Length, mm 120 150 195
 Each42 .50 .66

For Nos. 12572-73; 10% discount to commercial institutions, 15% discount to educational institutions for orders amounting to \$100.00 or above.

12574. SPATULAS, Hard Rubber, solid, with flexible blade.
 Length, inches 4 6 8
 Each40 .55 .80

10% discount in lots of 12; 20% discount in lots of 144.

12576. SPATULAS, Steel, Flexible, with cocoa wood handle.
 Length of blade, inches 3 4 6 8 10 12
 Each35 .40 .45 .65 1.10 1.80

10% discount in lots of 12; 20% discount in lots of 144.

12578. SPATULAS, Steel, Very Flexible, with narrow point for weighing, and wood handle.
 Length of blade, inches 3 4 5
 Each50 .70 .80

10% discount in lots of 12; 20% discount in lots of 144.

12580. SPATULA, Steel, with special 4 inch blade, very stiff. Widely used in baking and milling laboratories for gluten mixing.45

10% discount in lots of 12; 20% discount in lots of 144.

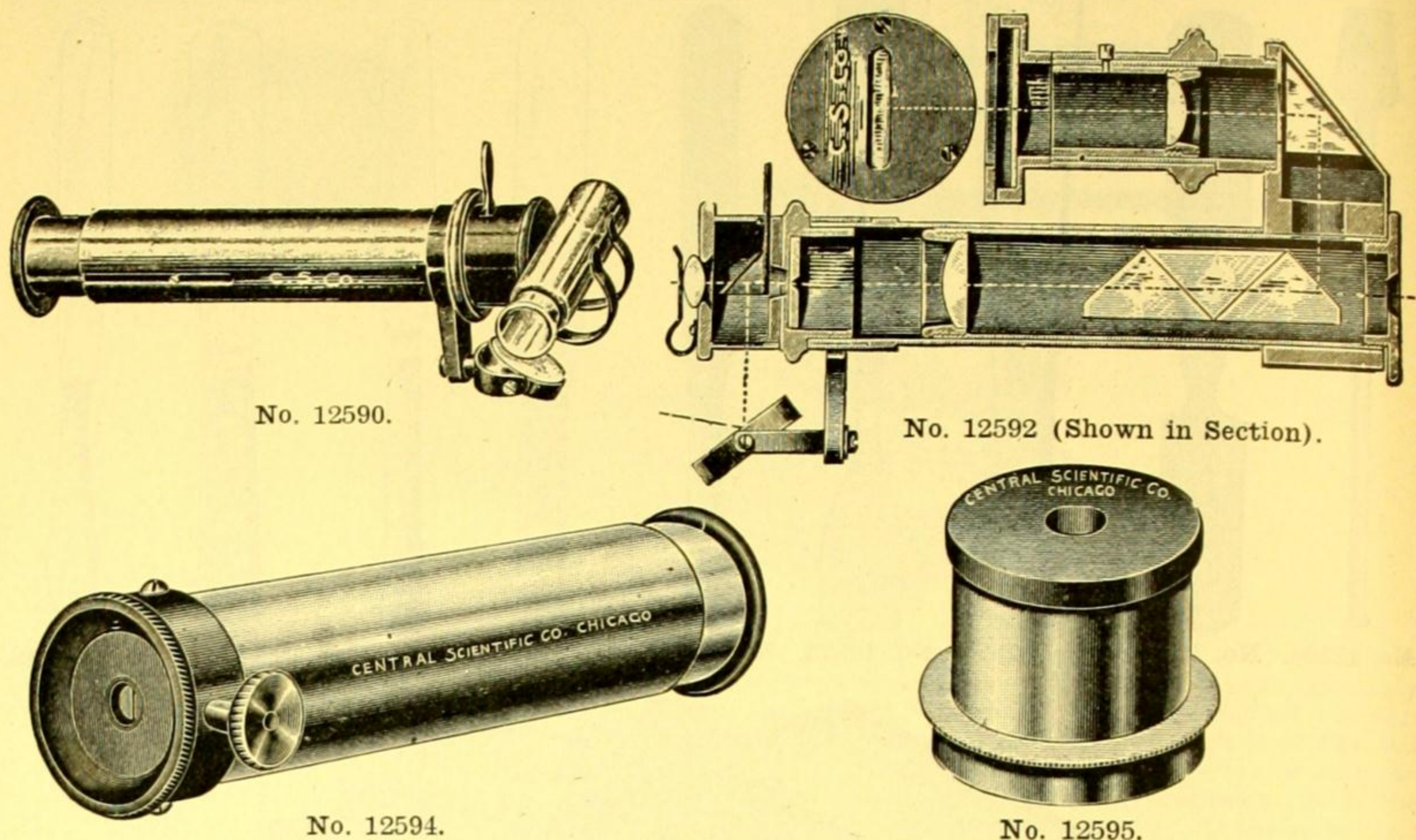
12582. SPATULAS, Solid Steel, Flexible, with balanced handle, nickel-plated.
 Length of blade, inches 3 4 6
 Each75 .80 1.00

10% discount in lots of 12; 20% discount in lots of 144.

SPECIFIC GRAVITY APPARATUS, see Bottles, Specific Gravity; Hydrometers; also No. 2500.

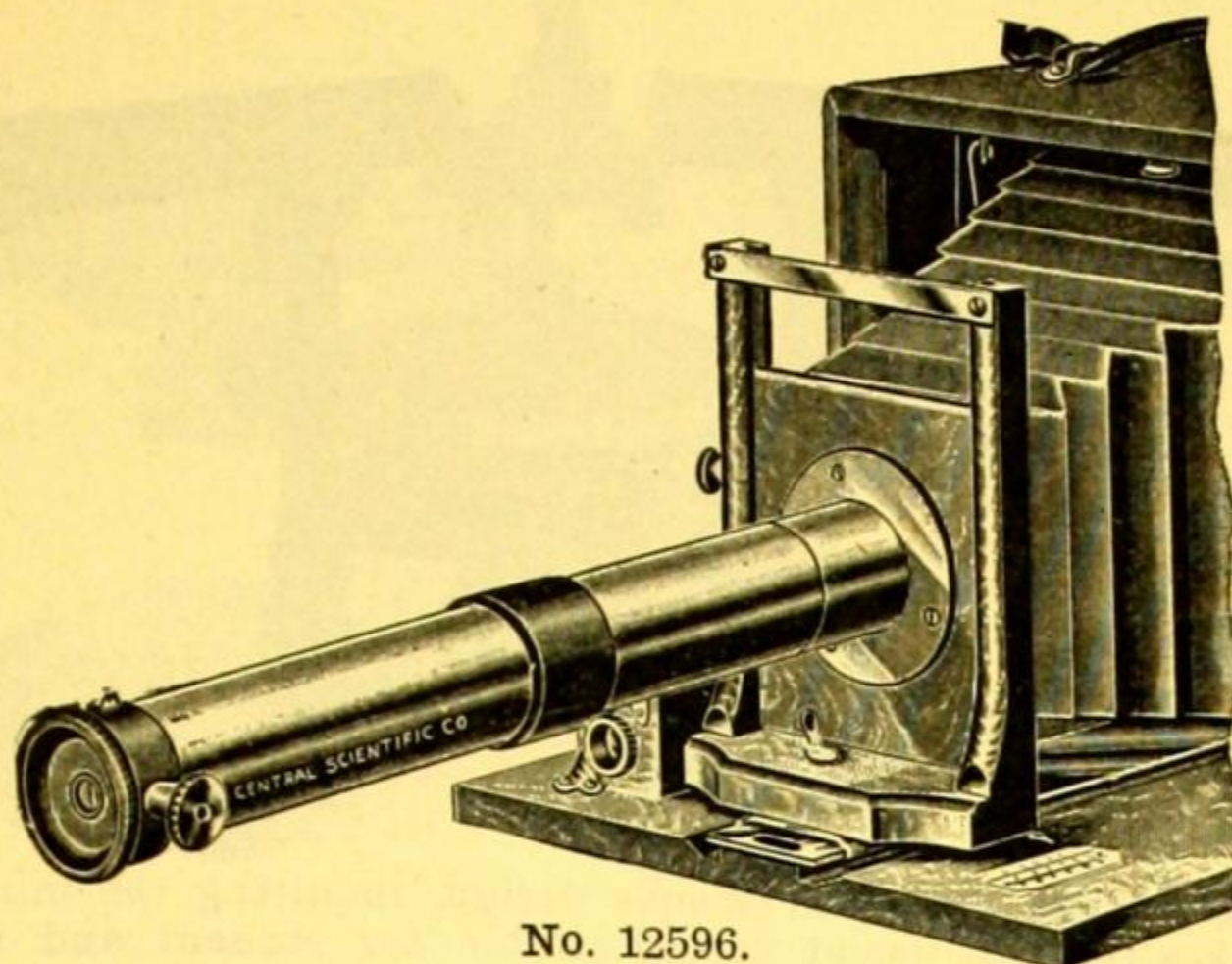
12588. SPECIMEN MOUNTS, Riker's, suitable for mounting insects, butterflies, fungi, shells, etc., or thick bulbs or plants too large for the Botanical Mounts, No. 1556.

Size, inches	2½x3	4x5	5x6	6½x8½	8x12	12x16
Each	.18	.23	.28	.35	.60	1.20
Per dozen	1.75	2.30	2.80	3.50	6.00	12.00

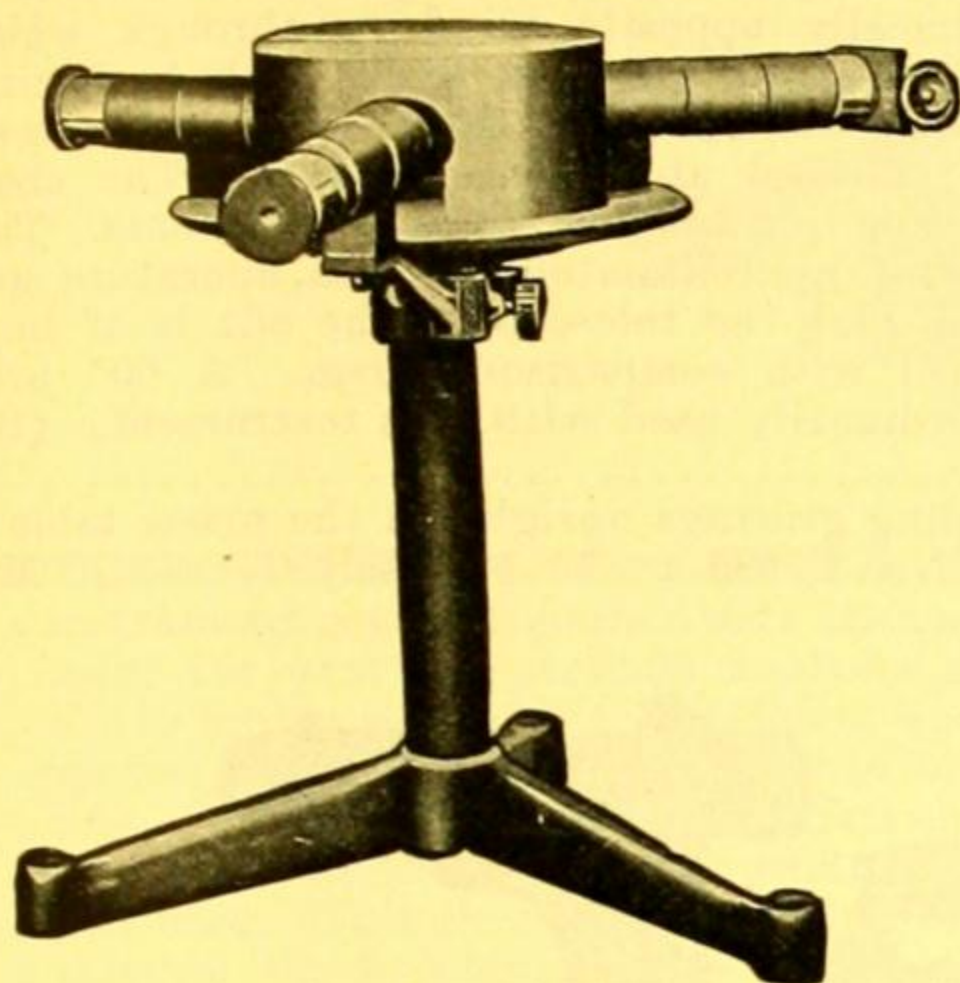


SPECTROSCOPES, SPECTROMETERS, SPECTROGRAPHS and SPECTROPHOTOMETERS

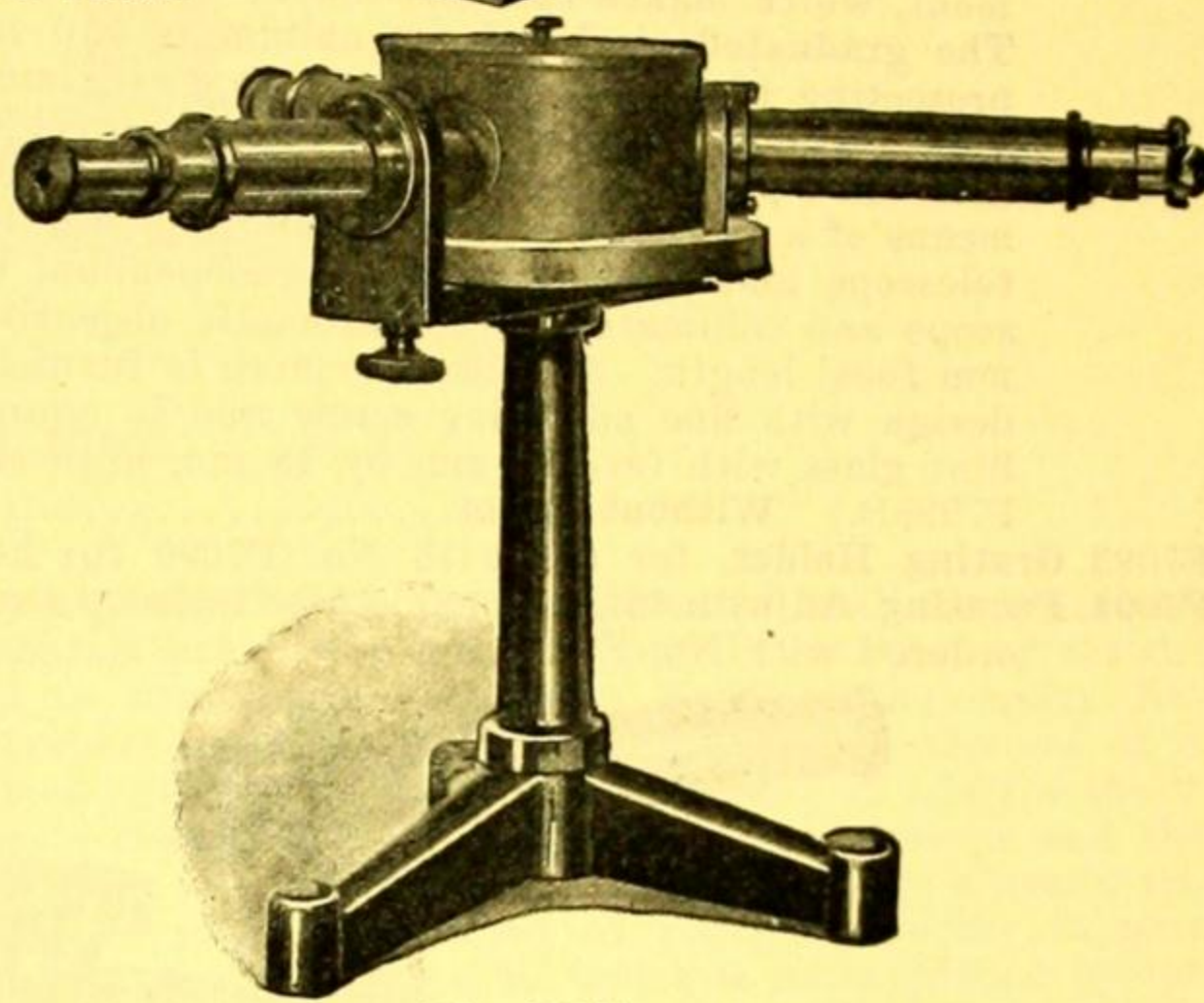
12590. **SPECTROSCOPE, Direct Vision**, for the observation of the absorption spectra of fluids and solids. Consists of a pocket size spectroscope approximately $3\frac{1}{2}$ inches long, provided with clamps for holding the specimen and with a comparison prism and mirror for projecting an unaltered spectrum beside the absorption spectrum to enable rapid comparisons to be made. The slit is adjustable. With this instrument, the Fraunhofer lines of the solar spectrum are easily discernible. Complete in case..... \$18.90
12592. **SPECTROSCOPE, Direct Vision with Wave Length Scale**. Similar to No. 12590 but approximately $4\frac{1}{2}$ inches in length and with an additional tube with scale and optical system, mounted on the spectroscope and parallel to it, which construction enables the scale to be illuminated by the light source producing the spectrum. The wave length scale is projected upon the two spectra, the unaltered and the absorption, enabling the operator to instantly determine the wave length of the light absorbed. Complete in case 33.00
12594. **SPECTROSCOPE, Wallace's Direct Vision Diffraction**, pocket form. This instrument is modeled somewhat on the lines of that of Thorp of England, but has been much improved and rendered more adaptable for general use. The dispersion piece consists of a 15,000 line replica which is mounted upon a 30° prism of light crown glass. The only object served by the prism is to deviate the direct image of the slit, which is thus thrown to one side out of the field of view, while the brilliant spectrum of the first order is seen in direct line of sight. By directing the vision at a small angle and using a sufficiently bright light the spectrum of the second order is readily available, which, with its greatly increased dispersion, is more suited for some observations.
- The collimating lens is of high quality and strictly achromatic, thus enabling the Fraunhofer lines to be defined sharply throughout a greater area in the spectrum than would be possible with a simple uncorrected lens, which would bring the lines in each color to a focus at a different plane.
- The slit mechanism is of the form usually supplied on a much higher grade of European instrument and is exceedingly ingenious in pattern. It is adjustable by means of a screw with milled head, which gives a smooth and even motion to the movable jaw. With direct sunlight (or electric arc) the D lines are shown well and clearly resolved in the spectrum of the second order, and with critical focusing, even in the first order 20.00
12595. **MICRO-SPECTROSCOPE, Wallace's**. The instrument fits over the ordinary eye-piece of the microscope and is instantly attached or removed without trouble. High dispersion, with direct vision, is secured by means of a Wallace grating prism of 15,000 lines to the inch, which gives a practically normal spectrum of much brilliancy. By an exceedingly simple and ingenious arrangement, varying widths of slit diaphragms may be made use of—three of which are provided with each instrument.
- Merely held in the hand close before the eye, this spectroscope eye-piece will be found an exceedingly handy piece of apparatus for the observation of colored flames in the chemical laboratory, etc. The instrument is manufactured of brass, handsomely finished..... 15.00



No. 12596.

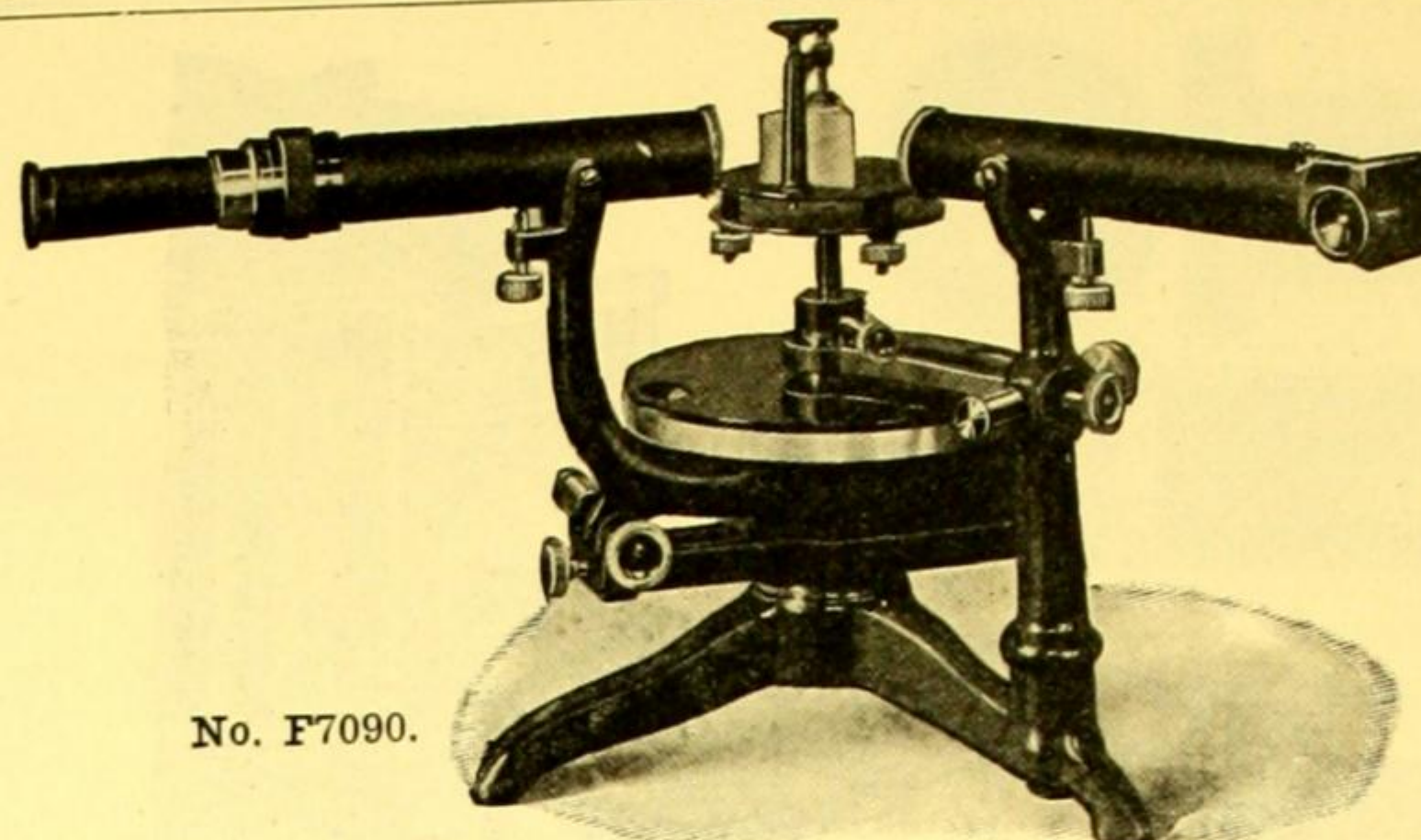


No. 12600.



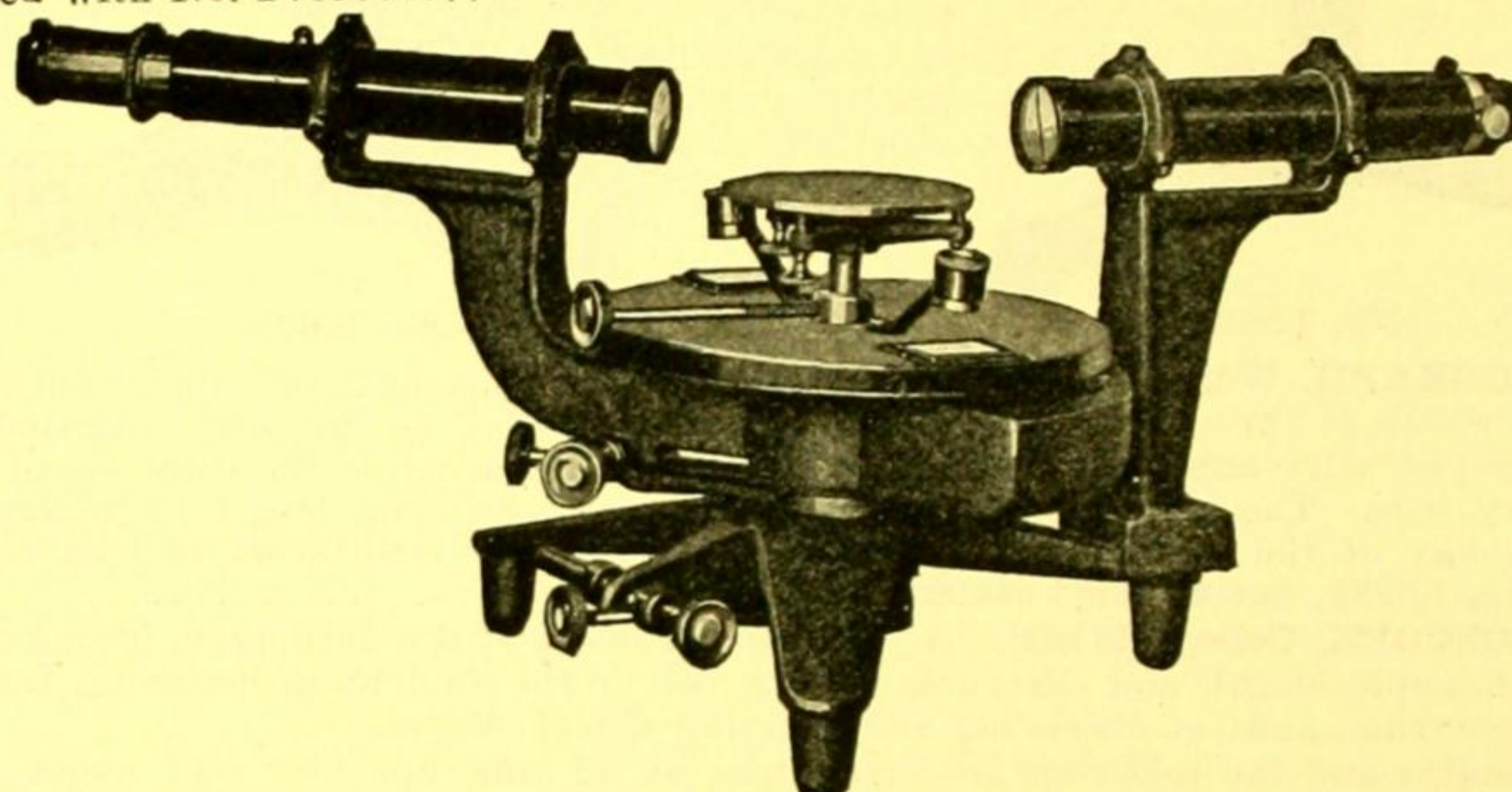
No. 12604.

- 12596 SPECTROGRAPH, Wallace's.** By a cleverly devised arrangement of supplementary tubes and a flange, which fit the instrument, Spectroscope No. F6981 is instantly adjusted for spectrum photography with any ordinary camera, the flange screwing on the front board in place of the ordinary lens. The instrument has been designed of sufficient length of adjustment to accommodate any of the various makes or forms of cameras—from short to long focus. Complete with No. F6981, but without camera..... \$27.50
- 12600. SPECTROSCOPE, College Model.** A small spectroscope of standard type, giving a brilliant spectrum of ample length and sharpness for the use of the student in becoming familiar with the solar spectrum, and for observing and charting flame spectra.
The collimator and the telescope objectives are of 15 mm aperture and about 125 mm focal length. The telescope has focal adjustment, and rotation to permit setting on any part of the spectrum. The scale is mounted on a draw tube to permit adjustment to the focus of the telescope. The position of the prism is marked on the prism table so that it may be readily readjusted, in case it is taken out of the instrument..... 42.00
- 12604. SPECTROSCOPE, University Model.** The collimator and the telescope objectives are of 25 mm aperture and about 160 mm focal length. The lenses are achromatic and of the best quality. The prism is mounted on a prism table having three leveling screws, which is accurately adjusted for the prism provided. The collimator and the position of the slit are also fixed in adjustment. The slit is of adjustable width and 10 mm length. It is so constructed that the jaws are kept together by spring pressure, thus avoiding any injury due to pressure by the micrometer screw. The jaws are made of hard nickel silver. The telescope rotates about the axis of the instrument by means of a tangent screw (not shown in the cut), over a sufficient angle to permit ready observation of the entire spectrum. It is provided with simple draw tube for focusing. The scale tube is mounted at the proper angle to secure full reflection from the face of the prism. The tube with its mount can be rotated about the axis of the instrument to bring the scale image to the proper position, by loosening a screw underneath which passes through a slot in the frame. This adjustment is made at the factory for the prism provided. The scale is a photographic negative having 16 figured divisions, each divided to tenths. Nine figured divisions are included in the field of view, each having the apparent length of about 12 mm viewed by the naked eye at a distance of 25 cm. The visible spectrum covers about 10 divisions, equal to about 40 degrees. An adjustable draw tube permits accurate focusing of the scale..... 80.00



No. F7090.

- F7090. SPECTROMETER, College Model**, of simple design, requiring the minimum amount of adjustment, which makes this instrument very desirable for student and routine laboratory work. The graduated circle of magnalium is 130 mm in diameter and is provided with a heavy protecting plate in which there are two diametrically opposite windows through which the scale readings are made. Verniers are provided to enable readings to be made to 1 minute of arc. The prism table is of large diameter and provided with three leveling screws. By means of a knurled-head screw the table can be clamped at various heights. The observing telescope and prism table have independent motion and tangent screw adjustments. The telescope and collimator have achromatic objectives of approximately 23 mm aperture and 160 mm focal length. A Gauss eye-piece is furnished with the telescope. The slit is of improved design with fine adjusting screw and is equipped with comparison prism. A 60° prism of flint glass with face 36 mm by 18 mm high is ordinarily used with this instrument. (See No. F7098B.) Without prism..... \$97.50
- F7093. Grating Holder**, for use with No. F7090 for holding gratings upright on the prism table 3.50
- F7094. Focusing Adjustment**, to enable the telescope of No. F7090 to be precisely focused. Must be ordered with No. F7090..... 8.00

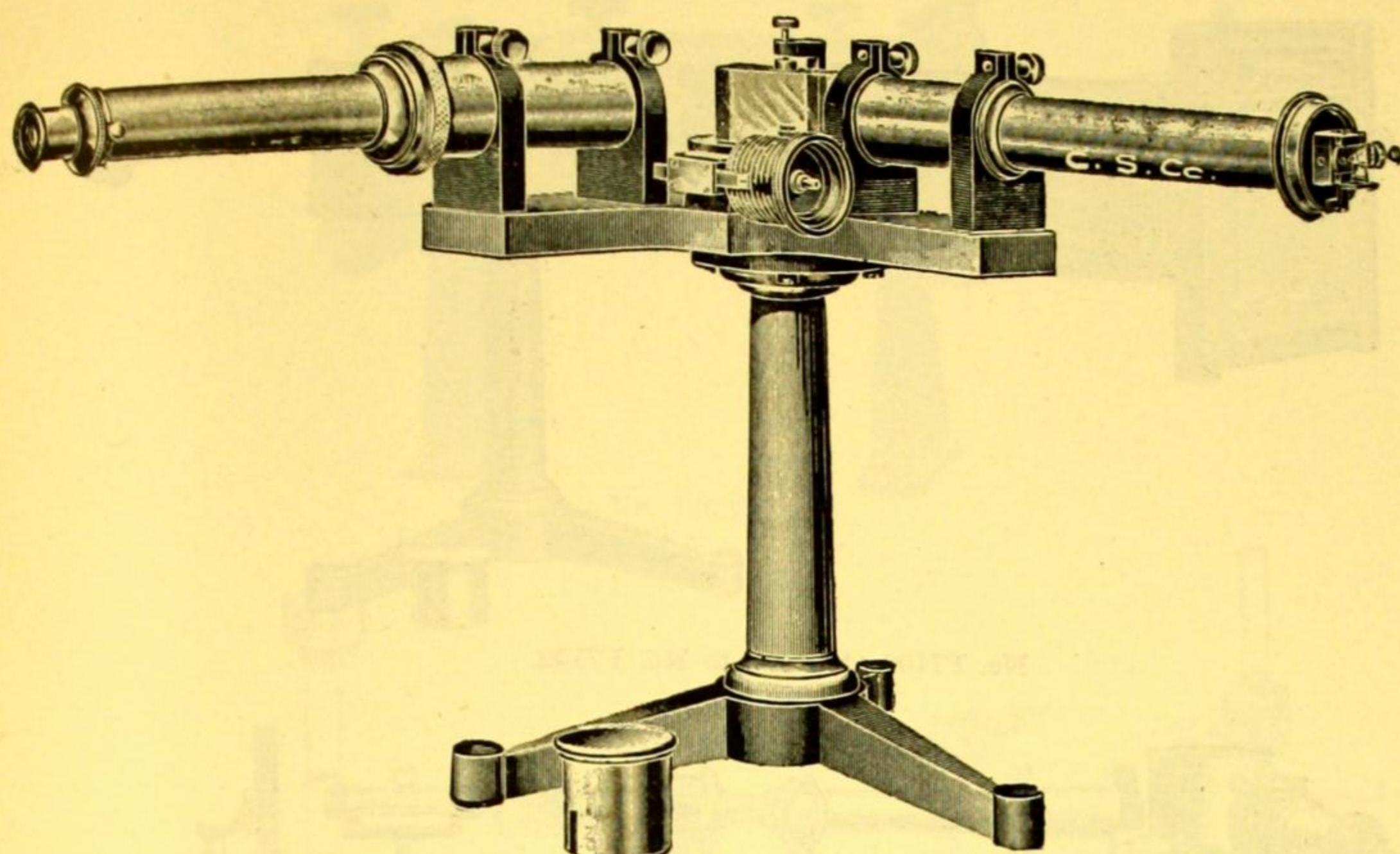


No. F7096.

- F7096. SPECTROMETER, Spencer**, similar to No. F7090 but of more sturdy construction. The graduated scale is 125 mm in diameter and is provided with a dust tight protecting cap. Readings are made by means of verniers fitted with reading magnifiers to 1 minute of arc. The telescope is equipped with an achromatic objective and Ramsden ocular focusable by a spiral mount. The collimator is provided with an achromatic lens which forms a sharply defined image of the slit. The slit is formed between two plates of metal carefully ground to knife edges and is operated by turning a knurled ring. The two parts move symmetrically from the center and remain perfectly parallel at all openings. A 60° prism of flint glass with faces 36 mm by 18 mm high is ordinarily used with this instrument. (See No. F7098B.) Without prism..... 110.00
- F7097A. Comparison Prism**, for use with No. F7096..... 7.00
- F7097B. Grating Holder**, for use with No. F7096 for holding gratings upright on the prism table. 3.50
- F7098. Prisms**, for Nos. F7090 and F7096, with 60° angles between the two polished faces. Refractive index approximately 1.65. For maximum resolving power and maximum intensity of spectrum procurable with a telescope of the aperture used, we advise the purchase of the size C prism.

No.	A	B	C
Height, mm	13.5	18	22.5
Length of side, mm	27	36	45
Each	4.50	7.00	18.00

Prices on Nos. F7096, F7097A and F7097B subject to 10% discount to hospitals and educational institutions.



No. F7102.

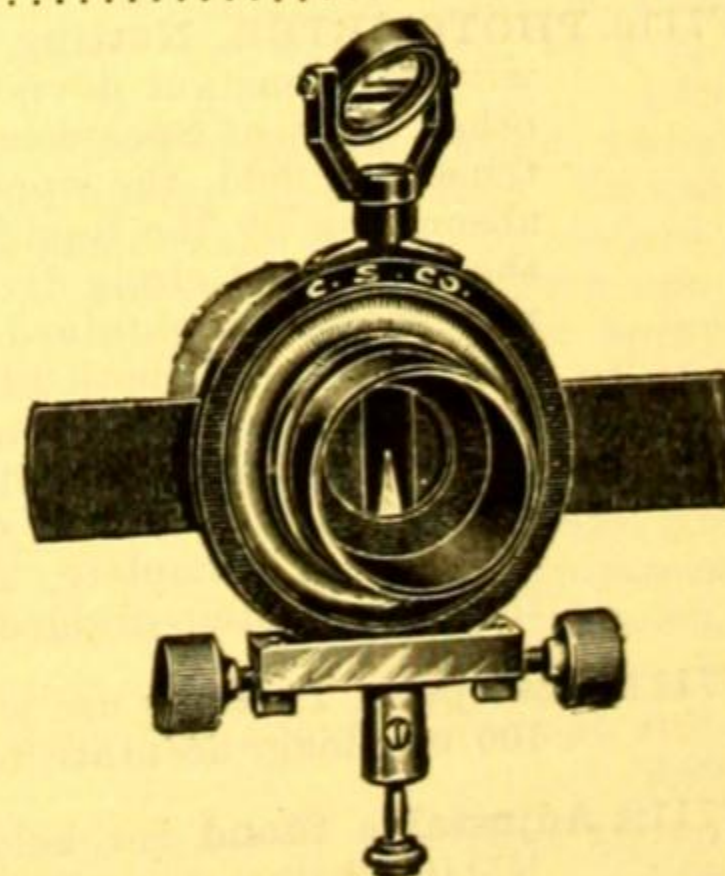
F7102. SPECTROMETER, WAVE LENGTH, Constant Deviation Type, Hilger. A well standardized instrument, which together with its accessories provides a most thoroughly satisfactory instrument for general spectrum analysis and in combination with the Nutting Photometer No. F7110 makes an extremely efficient spectrophotometer. The design is based on the use of a special dense constant-deviation prism made of glass with a refractive index of 1.74 for the D line. The use of this type of prism permits the rigid fastening of both the telescope and the collimator to the heavy cast-iron spectrometer bed, which in turn is supported by a heavy tripod base. This design insures stability and constant alignment of parts. In order to pass through the spectrum, it is only necessary to rotate the prism, which is accomplished by the pressure of a hardened steel screw upon a hardened steel peg in the prism table. The screw is advanced by turning the graduated drum to which it is attached. The graduations on the drum read directly in wave lengths from 390 $\mu\mu$ to 800 $\mu\mu$, the readings being indicated by an index that travels in a helical slot in the drum. This index is readily read without removing the eye from the telescope. The objectives of both the telescope and the collimator have a focal length of 285 mm and an aperture of 31.5 mm. The focusing of the telescope is accomplished by turning the knurled ring at its mid-point, which moves the objective without the liability of a lateral shift of the lines. As an example of the application of this instrument to routine laboratory processes, such determinations as the presence of from 0.004 per cent. to 0.2 per cent. of lead in copper can be made with it with speed and accuracy. Complete with prism and protecting cover for the prism table..... \$455.00

F7102A. Case, Hardwood, with lock and key for No. F7102 38.50

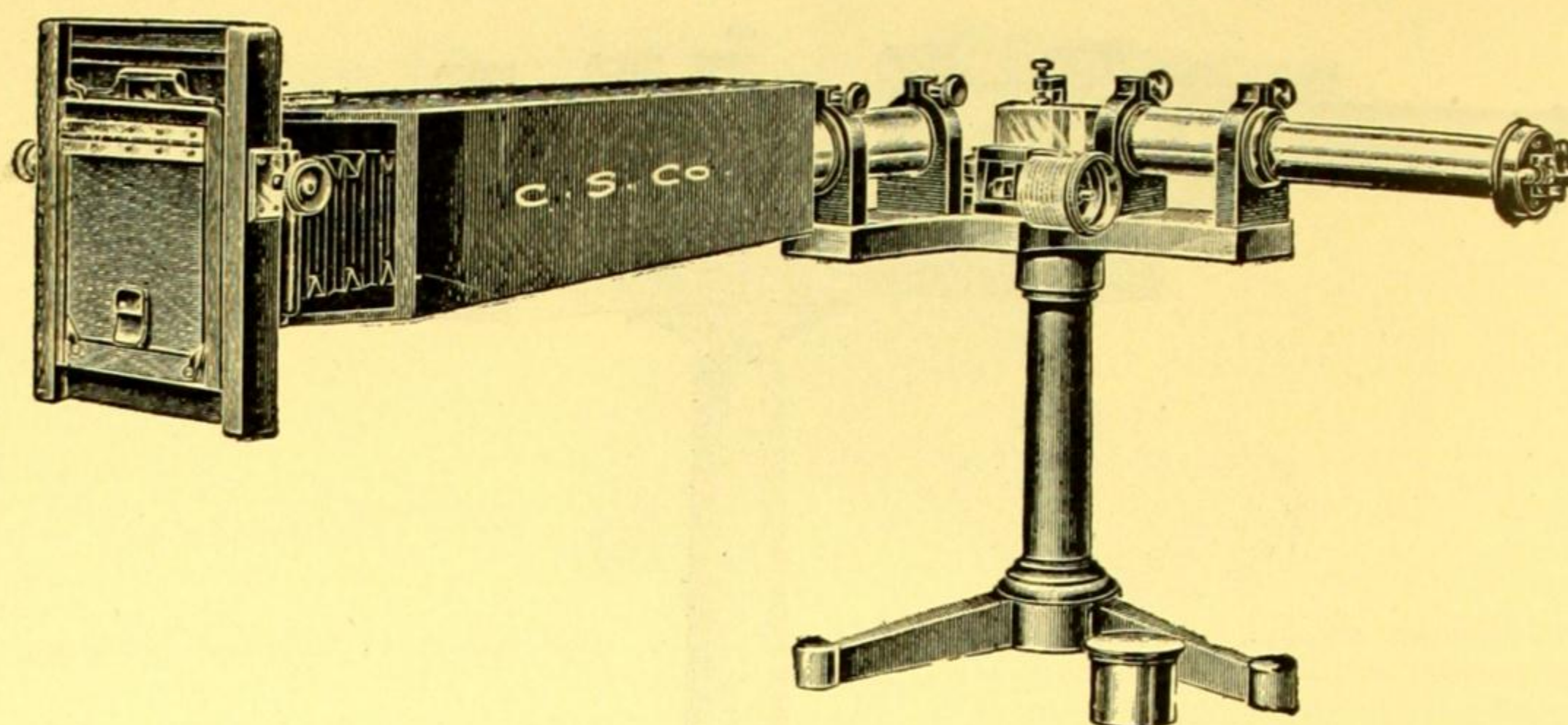
F7103. Eyepiece, High Power, with zero adjusting cross hairs, for use with No. F7102 Wave Length Spectrometer 30.00

F7104. Eyepiece, Shutter, for use with No. F7102 Wave Length Spectrometer. An eyepiece with two shutters, which can be shifted from either side in the focal plane so as to cover any desired part of the field, thereby obscuring any bright lines which, by their proximity, prevent the observation of feebler lines. A metal pointer, whose extremity is ground exceedingly fine and polished bright with the greatest care, is illuminated from above by a mirror. The pointer is adjustable laterally by two milled head screws, so that one can always return to the standard reading by setting the bright pointer on a reference line 60.50

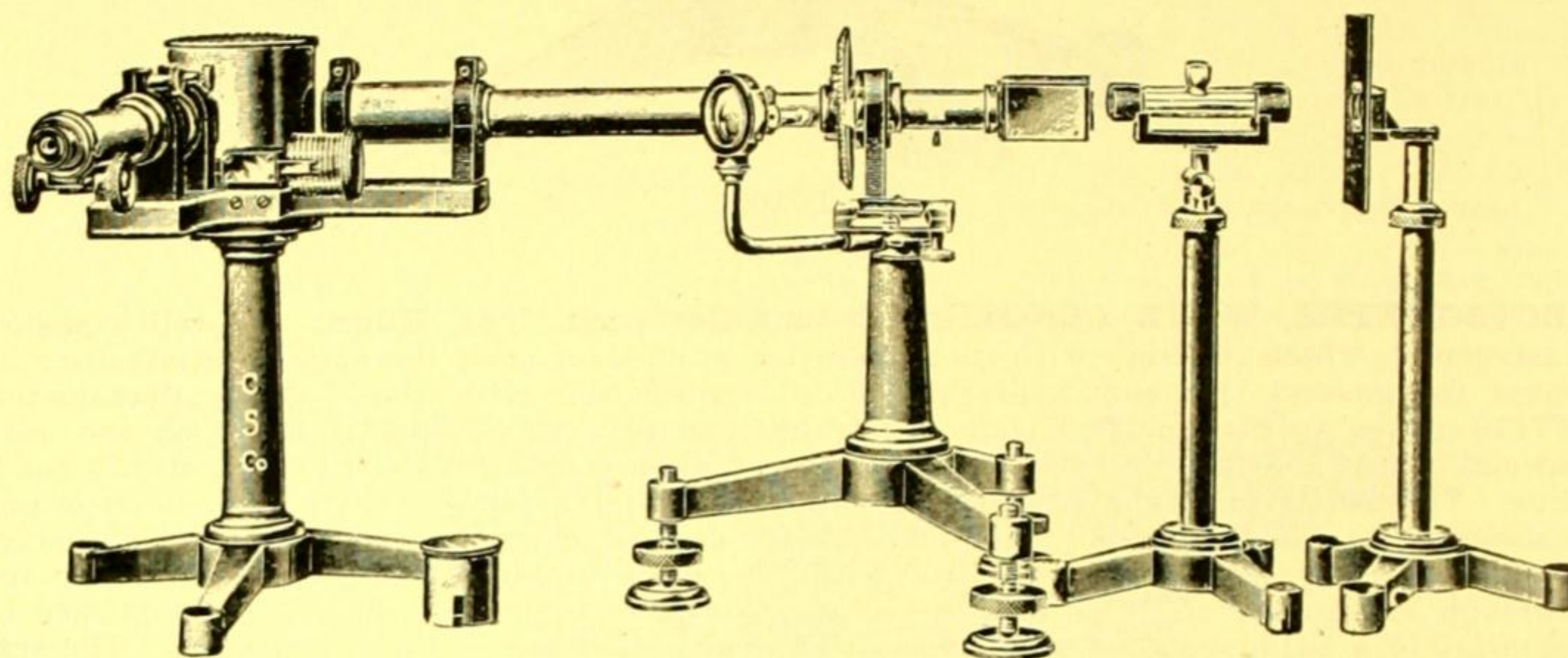
F7105. Light Filters, mounted in a slide, for use with No. F7104 Shutter Eyepiece to give the bright pointer any desired color, by means of which an increase of accuracy and comfort in reading can be secured, especially in the violet part of the spectrum..... 16.25



No. F7104.

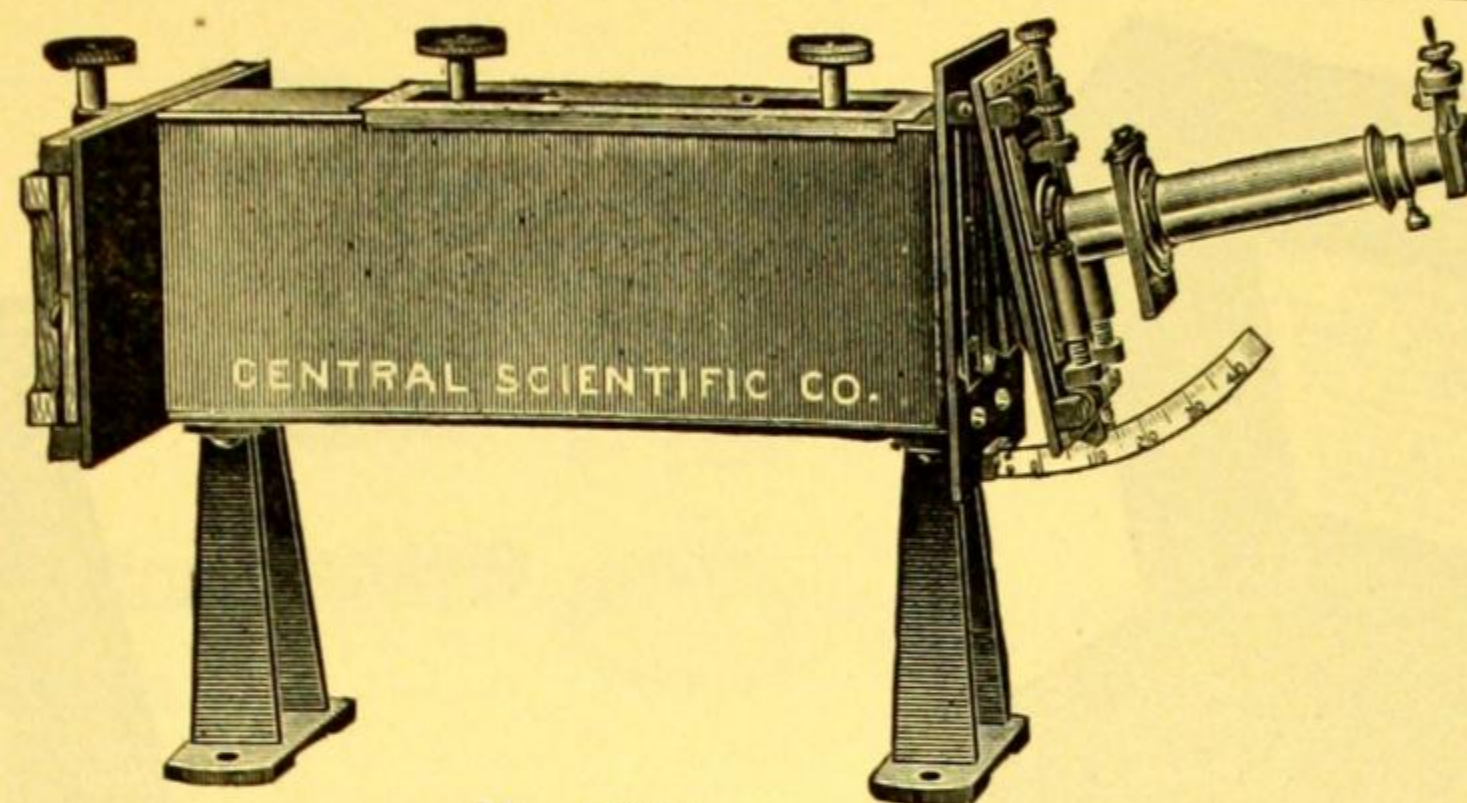


No. F7106 attached to No. F7102.

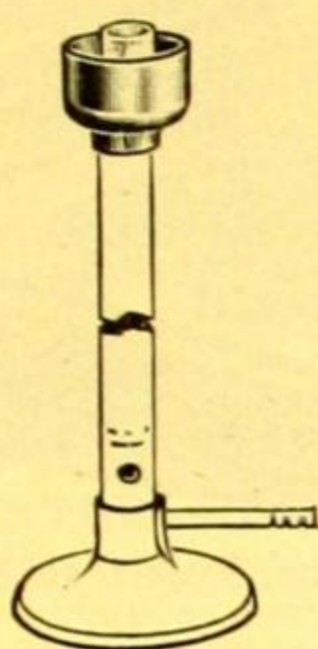


No. F7102 showing Nos. F7110, F7111 and F7112 in position.

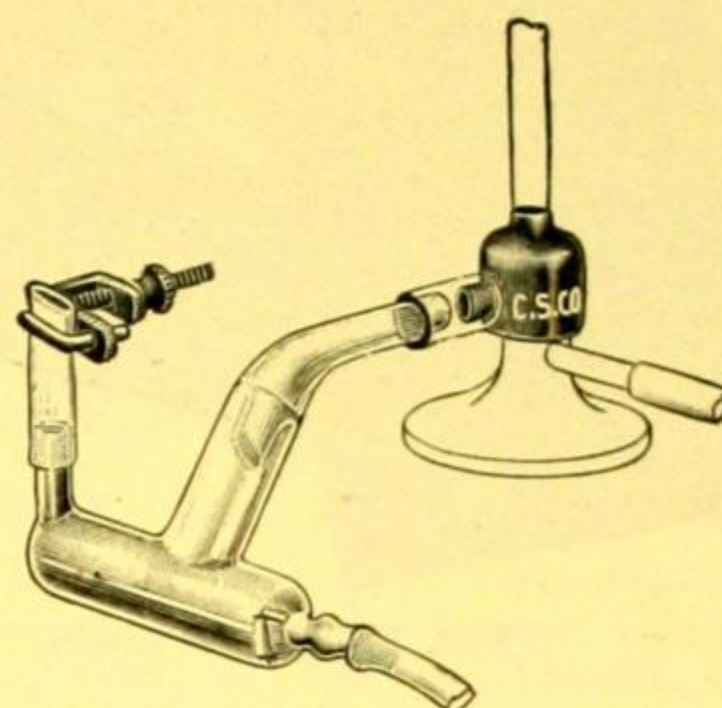
- F7106. Camera**, with 21 inch focus lens, for photographing spectra with No. F7102 Wave Length Spectrometer. A tilting adjustment is provided for focusing the entire spectrum. The plate holder is moved vertically by means of rack-and-pinion to enable a series of exposures to be made on the same plate. A shutter is provided for making the exposures. For plates $3\frac{1}{4}$ by $4\frac{1}{4}$ inches \$115.50
- F7107. Telescope**, for use with No. F7106 Camera on No. F7102 Wave Length Spectrometer for observing the spectrum immediately before photographing. The telescope is placed on the collimator side of the camera, so that the slit, wave-length drum and light source are all within reach of the observer. The spectrum is reflected from the camera into the telescope by means of a mirror operated by a milled head on the telescope 99.00
- F7110. PHOTOMETER, Nutting**, a polarization form of photometer especially for use in conjunction with the constant deviation Wave-length Spectrometer F7102, but may be used with success on other types of Spectrometers. The photometer projects upon the slit of the spectrometer a tripartite field, the upper and lower fields being illuminated by the light which has suffered absorption by the liquid under test and the other being reduced in intensity by the rotation of the graduated circle divided both in "densities" and degrees. Correct conditions of illumination have been obtained in this instrument by using two beams of light from a single source for illuminating both tubes. Tubes for liquids or gases of any desired length can be used. This instrument is invaluable for testing purity of dyes, comparison photometry of light sources, quantitative estimation of certain alkaloids having characteristic absorption spectra, estimation and control of fractionation of rare earths by their absorption spectra, matching colors, etc. Complete, with leveling screws, beam parallelizing device and small electric lamp for illuminating divided circle..... 585.00
- F7111. Absorption Tube** for use with Photometer No. F7110 on No. F7112 Stand. Consists of a glass tube 100 mm long, accurate to ± 0.1 mm, with screw cap ends and side tube for filling.... 14.25
- F7112. Adjustable Stand** for holding No. F7111 Absorption Tube in the proper position in front of No. F7110 Photometer. Will take tubes 100 mm or more in length..... 42.50



No. 12620.



No. F7115.



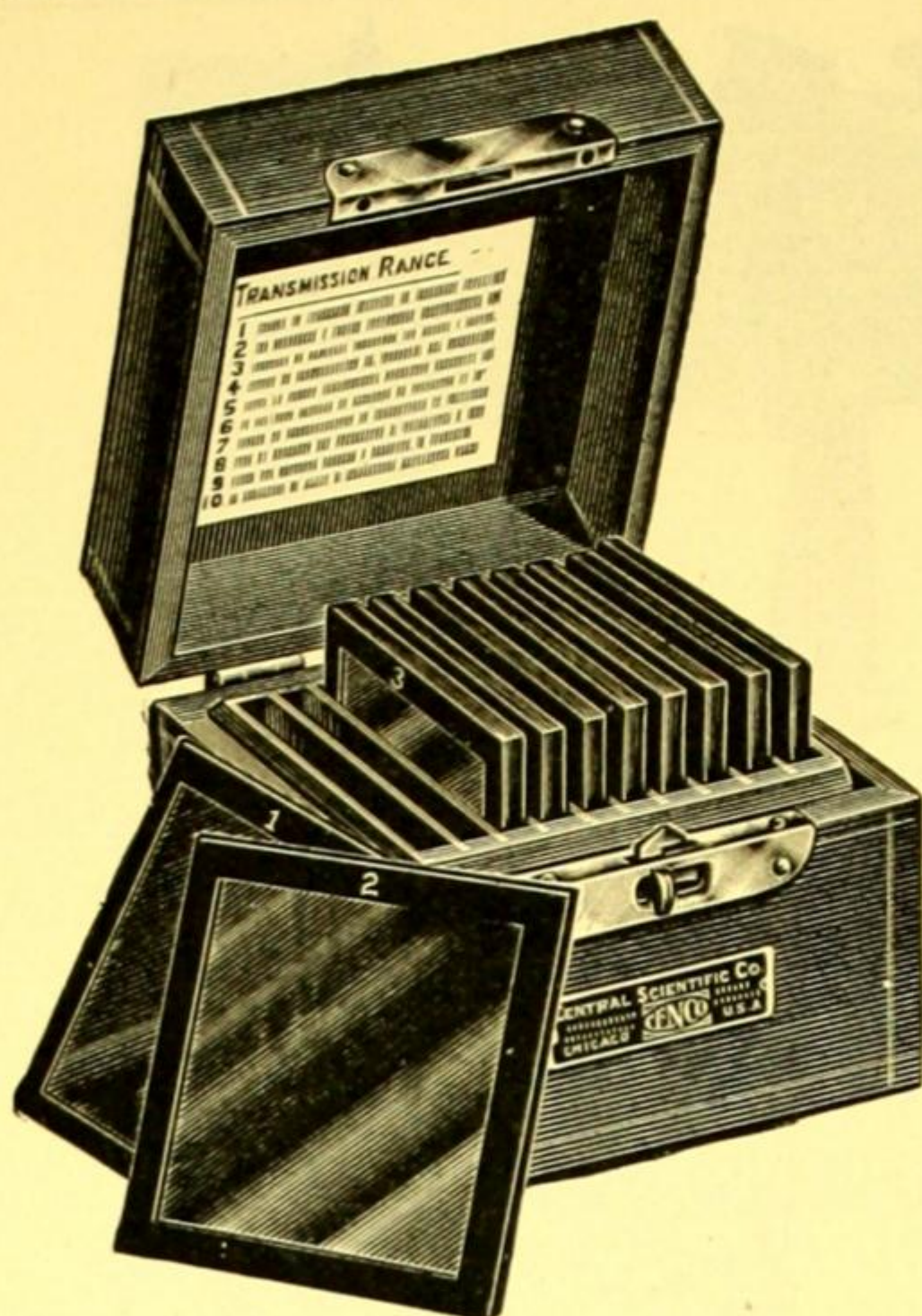
Nos. F7117 & 7118.

12620. **PHOTO-SPECTROSCOPE**, after specifications by Dr. R. James Wallace. Light from a slit with micrometer adjustment is made parallel by the collimator lens and falls on a Wallace replica grating mounted on the body of the instrument. Another lens, provided with suitable diaphragms, focuses the spectrum on a photographic plate, $3\frac{1}{4} \times 4\frac{1}{4}$ ", mounted in a plate-holder which has rack-and-pinion adjustment, so that ten spectra can be photographed on the same plate. The collimator-tube is mounted on a metal plate hinged to the front of the instrument and connected with it by a light-proof bellows. This plate may be set at any angle with the vertical up to 40° , thus allowing any portion of the spectrum to be centered on the plate. Adjustment screws enable the collimator tube to be shifted in two directions at right angles to each other, so that the parallel light can be made to fall on the center of the grating with any angle of incidence. This instrument is especially suited for the sensitometry of photographic plates (see "The Astrophysical Journal," Vol. XXV, No. 2, March, 1907, p. 116), and has proven of great service in chemical work.

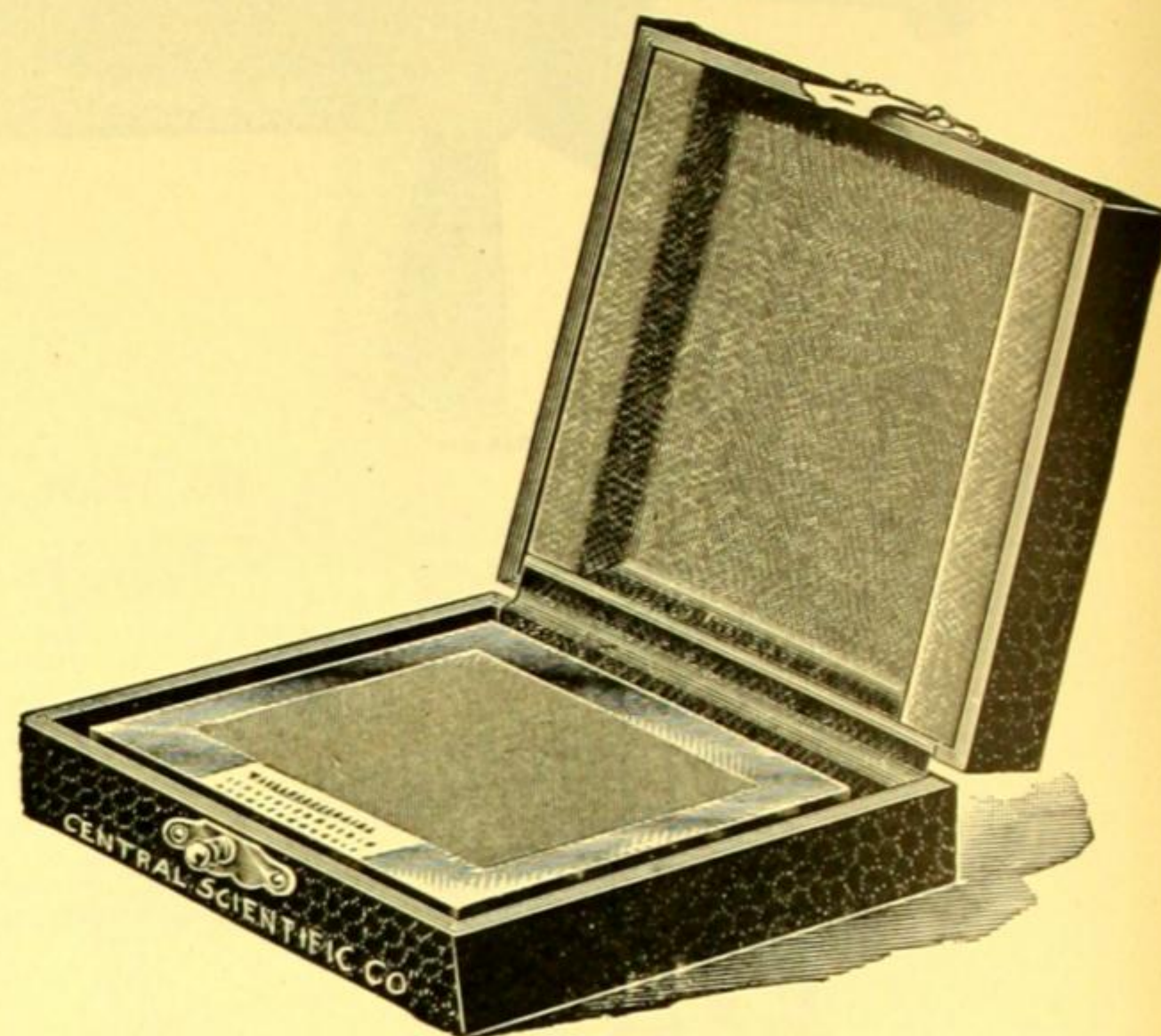
Of brass, finely finished, and provided with a 15,000 line, Grade A, Wallace replica grating. \$350.00

ACCESSORIES FOR USE WITH SPECTROSCOPES, SPECTROMETERS, SPECTROGRAPHS AND SPECTROPHOTOMETERS.

- F7115. **Monochromatic Flame Attachment** for Bunsen burners. A small reservoir which slips over the top of the burner is provided with an asbestos wick at the center. This wick surrounds the mouth of the burner closely and feeds up to the flame any solution placed in the reservoir. The flame is therefore continuously colored with the characteristic color of the salt which is in the solution, and frequent renewals are not necessary, as only a small portion of the dissolved substance is consumed. As the water evaporates more is easily supplied. For any burner with $\frac{7}{16}$ -inch tube 1.50
- Monochromatic Flame Device.** Consists of a glass aspirator (No. F7117) of special design, and a metal hood (No. F7118) for use with the ordinary Bunsen burner having $\frac{7}{16}$ -inch tube. In use the aspirator is partially filled with a solution of the salt whose flame reaction is to be studied, and rubber tube connections made as shown in the illustration. Rubber tube A is then connected to a bellows or other source of constant air pressure. A portion of the fine spray formed in the aspirator is carried over through the burner hood into the air holes of the Bunsen burner and gives to the flame the characteristic color of the salt whose solution is being used. This color is continuous as long as the air blast is kept up so that the spectra of the different elements may readily be studied. A convenient outfit for laboratory use for each student would consist of one No. F7117 Burner Hood with as many No. F7118 Aspirators as may be desired, one aspirator being kept filled with each solution, known and unknown, which is to be studied.
- F7117. **Aspirator**, for monochromatic flame work. Of glass, for use as described above. Without rubber tubing or pinchcock 2.50
- F7118. **Burner Hood**, of metal, for use with Bunsen burner having $\frac{7}{16}$ -inch tube, as described above. Without burner 1.00



Nos. 12624 and 12626.



Nos. F6951 to F6963.

SPECTROSCOPE ACCESSORIES—Continued

12624. **Color Filters, Wallace**, for spectro-photography, prepared by Dr. R. J. Wallace, formerly Photo-Physicist of Yerkes Observatory and later Director of the Research Laboratories of the Cramer Dry Plate Co. Consists of a set of ten gelatine coated glass plates, each stained to the required depth, with a combination of dyes, to permit the transmission of certain portions of the spectrum. By using different combinations of filters it is possible to transmit limited ranges of the spectrum, enabling the photography of weak lines, which would otherwise be "fogged" by undesirable bright lines. Each filter is numbered for convenience in referring to the scale of transmission ranges printed on the inside of the cover of the leather covered wooden carrying case \$13.00

12626. **Color Filters, Wallace**, same as No. 12624 but with the gelatine films mounted on optical glass of the finest quality 25.00

Spectrum Gratings, Replica, Wallace, prepared by Dr. R. J. Wallace from original Rowland and Michelson gratings. The gratings consist of a hard, horny film of collodion of special composition, which bears the impressions of the original grating, mounted upon a piece of selected optical glass under conditions which assure perfect parallelism of the grating lines. During the process of stripping the collodion film from the original grating and subsequent drying, they suffer slight contraction, which slightly increases the number of lines to the inch, thus altering the "grating constant." The superiority of the transparent gratings for a very considerable amount of work is evident, while the uniformity of production and comparatively low price at which they are sold, make them available for many kinds of research work where the cost of an original grating would prohibit the undertaking. The gratings are graded by Dr. Wallace, who marks the grade and date of testing on the glass mounting and signs them as an additional guarantee of their quality.

The four grades are as follows:

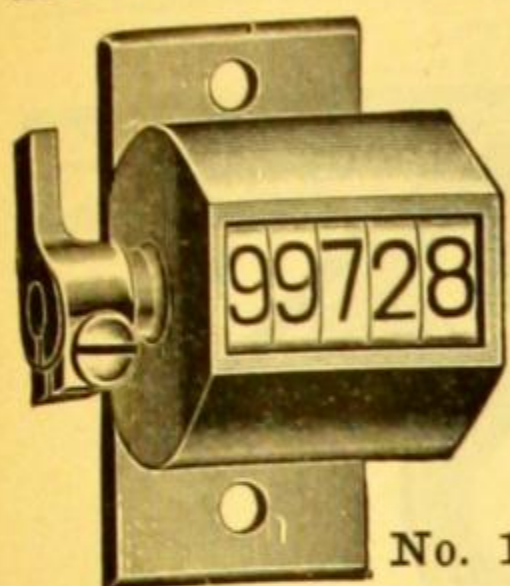
Grade A have 19 times the resolving power necessary to separate the D lines and are furnished in a leather covered case.

Grade B have 11 times the resolving power necessary to separate the D lines and are furnished in a leather covered case.

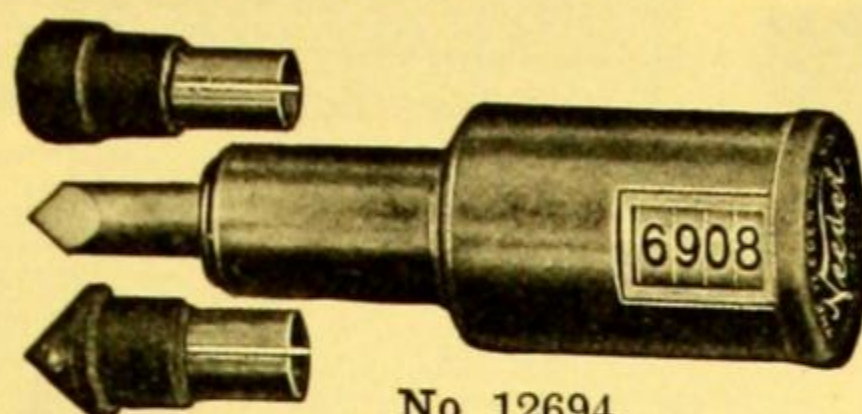
Grade C separates the D lines and shows the Ni line between them.

Grade D is suitable for projection purposes.

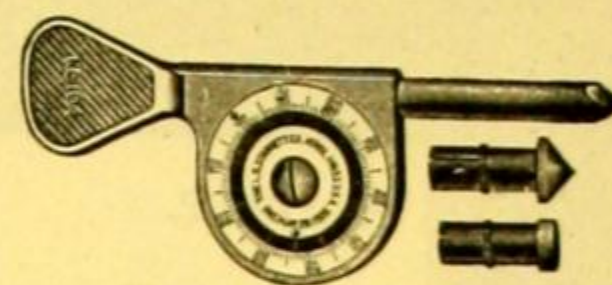
Grade	A	B	C	D
F6951. Wallace Gratings , ruled surface 25x21 mm, 10,000 lines per inch....	5.00	4.00	3.00	2.00
F6953. Wallace Gratings , ruled surface 28x20 mm, 14,438 lines per inch....	5.00	4.00	3.00	2.00
F6955. Wallace Gratings , ruled surface 25x21 mm, 15,000 lines per inch....	5.00	4.00	3.00	2.00
F6957. Wallace Gratings , ruled surface 47x35 mm, 15,000 lines per inch....	8.00	7.00	5.00	3.00
F6961. Wallace Gratings , ruled surface 25x30 mm, 25,000 lines per inch....	6.00	5.00	4.00	3.00
F6963. Wallace Gratings , ruled surface 50x30 mm, 25,000 lines per inch....	10.00	8.00	6.00	4.00



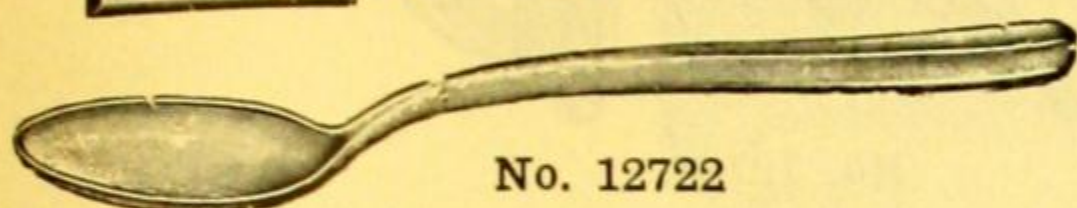
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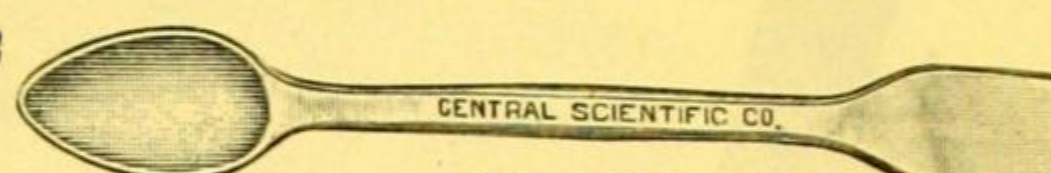
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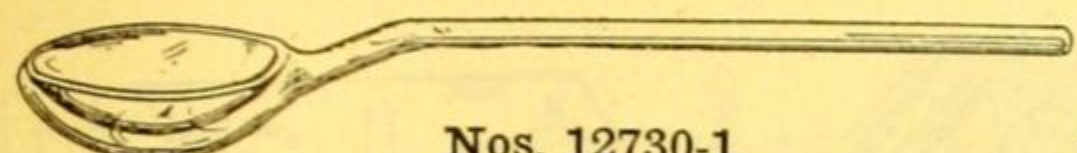
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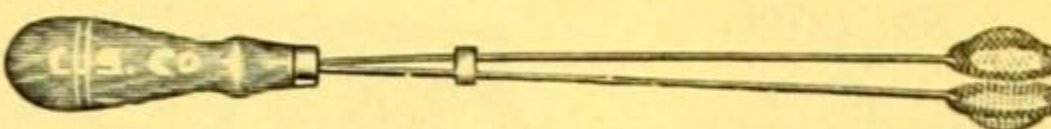
No. 12722



No. 12742.



Nos. 12730-1.



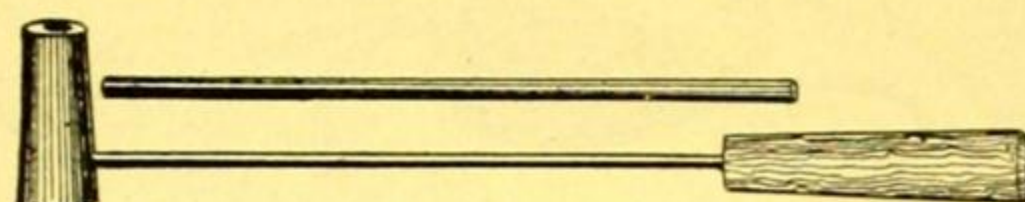
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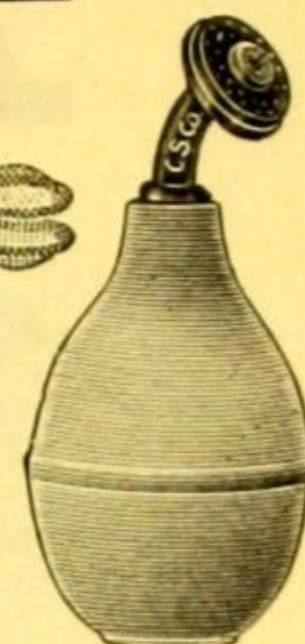
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No. 12736.

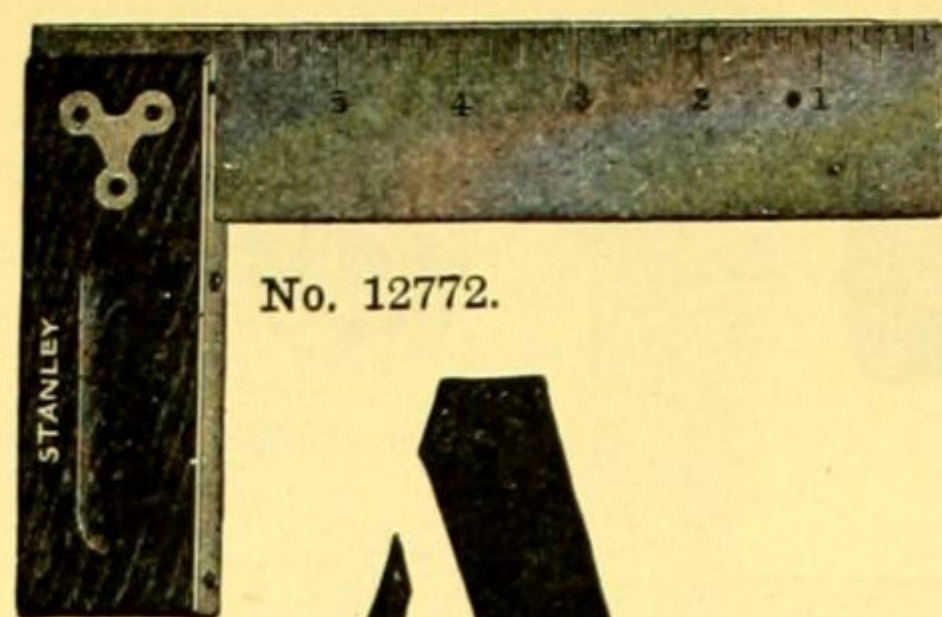


No. 12746.



No. 12756.

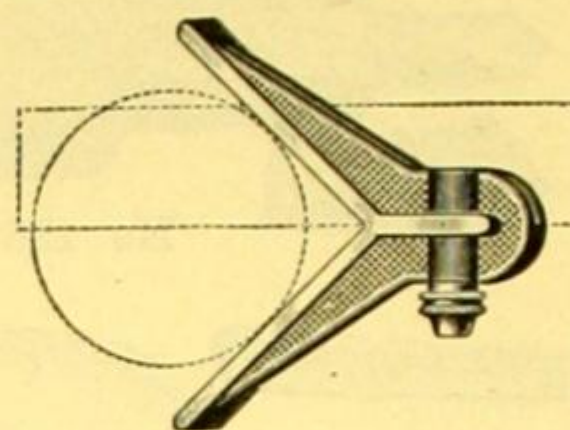
12692. **SPEED COUNTER or REVOLUTION COUNTER**, suitable for any purpose requiring a small, light and accurate counter. Registers up to 99,999. Its action is very smooth and uniform and it will stand a very high rate of speed. If run backwards, it counts backwards. Illustration is full size. Nickel-plated..... \$2.00
12694. **SPEED COUNTER or REVOLUTION COUNTER**, with ball thrust bearing and spring clutch which allows the spindle to turn freely until the second hand of one's watch has come to zero; a slight pressure on the end of the instrument starts the count; when pressure is released the count stops. Registers 9,999, and can be used on either high speed or low speed machinery. One pointed and one flat rubber tip furnished which serve as insulators when taking the speed of electric machinery. The flat tip can also be used on flat or pointed shafts. Nickel-plated 3.50
12698. **SPEED INDICATOR**, improved form, may be run at highest speed required without heating; dial plate has two rows of figures reading right or left; rubber tips for both pointed and centered shafts, which not only remove the jar and run smoothly, but produce a stronger frictional contact with the shaft. The rotating disk, being carried by friction, may be moved to the starting point where the raised knobs coincide. Pressing the raised knob on the rotating disk with the thumb prevents the disk from moving until the hand of the watch gets to the right position to take the time. Every hundred revolutions may be noted by feeling the knob pass under the thumb, thus relieving the eye which has only to look on the watch to note the time. Nickel-plated 1.40
- SPINTHARISCOPE**, see **Radioactivity Apparatus**.
12714. **SPLINTS**, 500 in package per package .10
12718. **SPONGES**, for cleaning purposes, best quality grass sponge, 16 to a pound..... per pound 1.50
12722. **SPOON**, Aluminum, table size, handle with ribbed center15
- SPOONS**, Deflagrating, see **Deflagrating Spoons**.
12730. **SPOON**, Glass, lamp blown, teaspoon..... .20
12731. **SPOON**, Glass, lamp blown, tablespoon..... .40
12734. **SPOONS**, Horn, plain form. 100 150 200
- Length, mm18 .30 .46
- Each25 .35 .55
12736. **SPOONS**, Horn, with spatula end. 100 150 200
- Length, mm25 .35 .55
- Each25 .32 .46 .60
- SPOONS**, Platinum, see **Platinum Ware**.
12742. **SPOONS**, Porcelain, with spatula end, glazed throughout. 96 120 140 160
- Length, mm25 .32 .46 .60
- Each 10% discount to commercial institutions, 15% discount to educational institutions for orders amounting to \$100.00 or over.
12744. **SPOON**, Sodium, of brass gauze, with cover and wooden handle55
12746. **SPOON**, Sodium, Capsule, with ram-rod, according to Brownlee..... .25
- SPRAYING MATERIAL**, see **Catalog A of Agricultural Apparatus**.
- SPRING BALANCES**, see **Balances**.
12756. **SPRINKLER**, Rubber, bulb of extra quality, 8 ounce size, with bent neck..... 1.20
- SPROUTING APPARATUS**, see **Grain Testing Apparatus**.
- SPUTUM BOTTLES**, Square, see No. 2757.



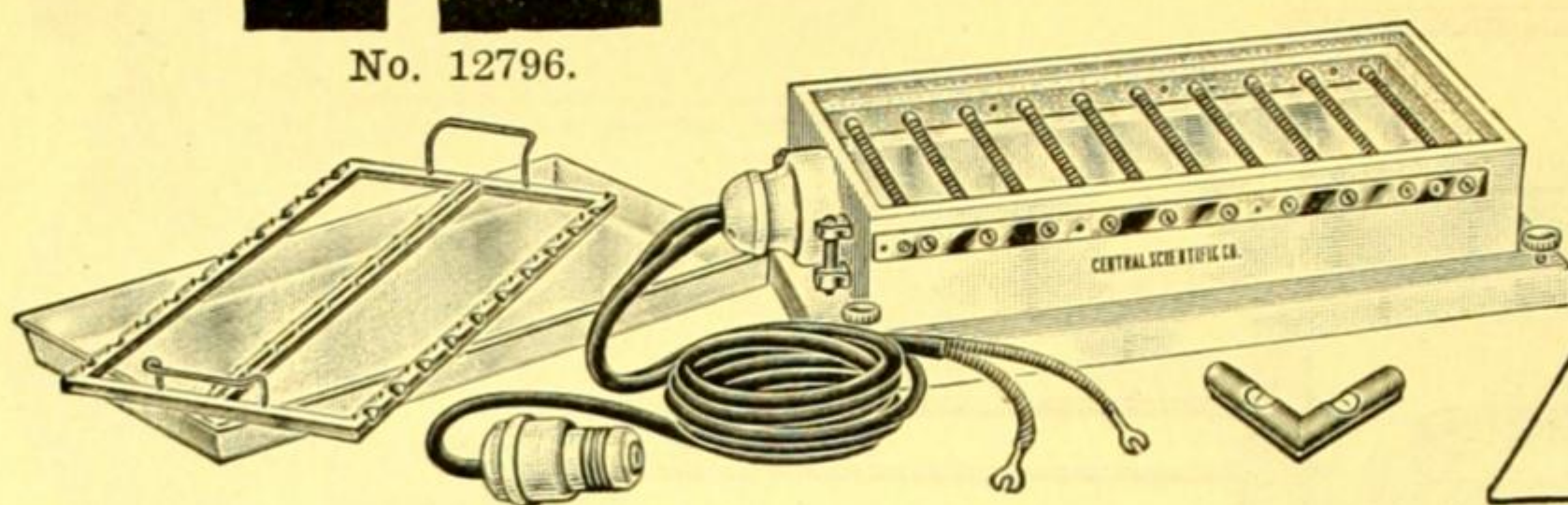
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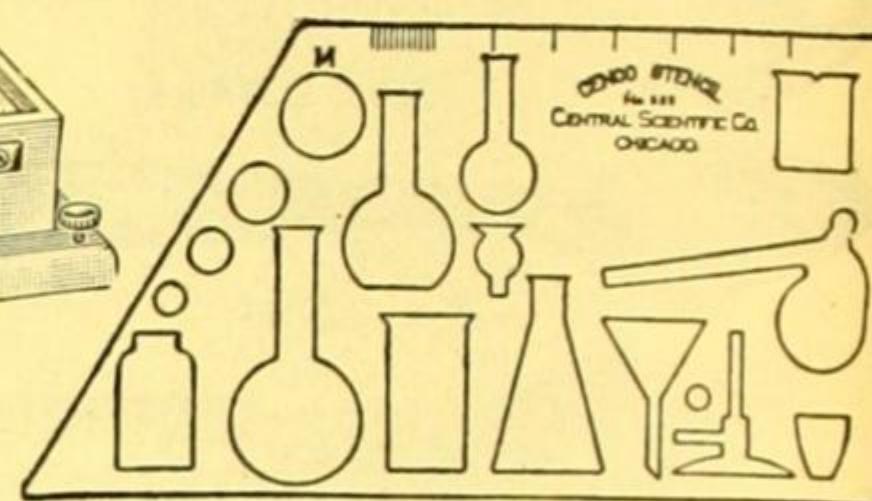
No. 12796.



No. 12768.



Nos. 12780-1.



No 12790.

12768. **SQUARE, Combination.** The equivalent of a set of try squares, a depth gage, a level, a mitre, and, with the auxiliary center head, a centering square, both inside and outside. Convenient for transferring exact measurements, laying out work, or to square in a mortise. Twelve inch blade graduated on one side in $\frac{1}{2}$ mm and 32nds of inches; on the other in millimeters and 64ths of inches. Complete, with center head and level..... \$3.50

12772. **SQUARE, Try,** blued steel blade graduated in 8ths of inches, and rosewood handle. Size 6 inches50

STAGES, Mechanical, see Microscope Accessories.

STAGES, Warm, see Microscope Accessories.

STAINING APPARATUS, Corper-DeKhotinsky, Electrically Heated, as used at the Municipal Tuberculosis Sanitarium of Chicago, a clean and neat device for hot staining and fixing. By its use it is possible to fix smears of sputum, etc., without danger of burning, to stain them without danger of boiling the carbolfuchsin solution and also to avoid dropping carbolfuchsin over the laboratory tables and floors. It consists of an asbestos wood frame with base which will stand red heat without destruction. In the bottom is a sliding metal shelf, to be filled with sand for catching any drippings and to aid in reflecting all the heat upward from the heating units, of which there is one for every two sides. These units, which are easily replaceable, are wound with chrome wire, which is insoluble in boiling carbolfuchsin. The slide carriers are nickel-plated brass frames made to fit in the asbestos frame at a suitable height above the electrical units. The base is provided with leveling screws. A set of fuses is placed on the apparatus, so that there is no danger from accidental short circuit. The apparatus is intended for ten standard 3x1 inch slides. It consists of heating box, slide carrier, tray, cross test level and five feet of asbestos covered cord and two plugs. Complete with rheostat for close regulation of heat.

12780A. For 110 volts 65.00

12781A. For 220 volts 65.00

12782. **Slide Carrier, extra,** for Nos. 12780A and 12781A 7.50

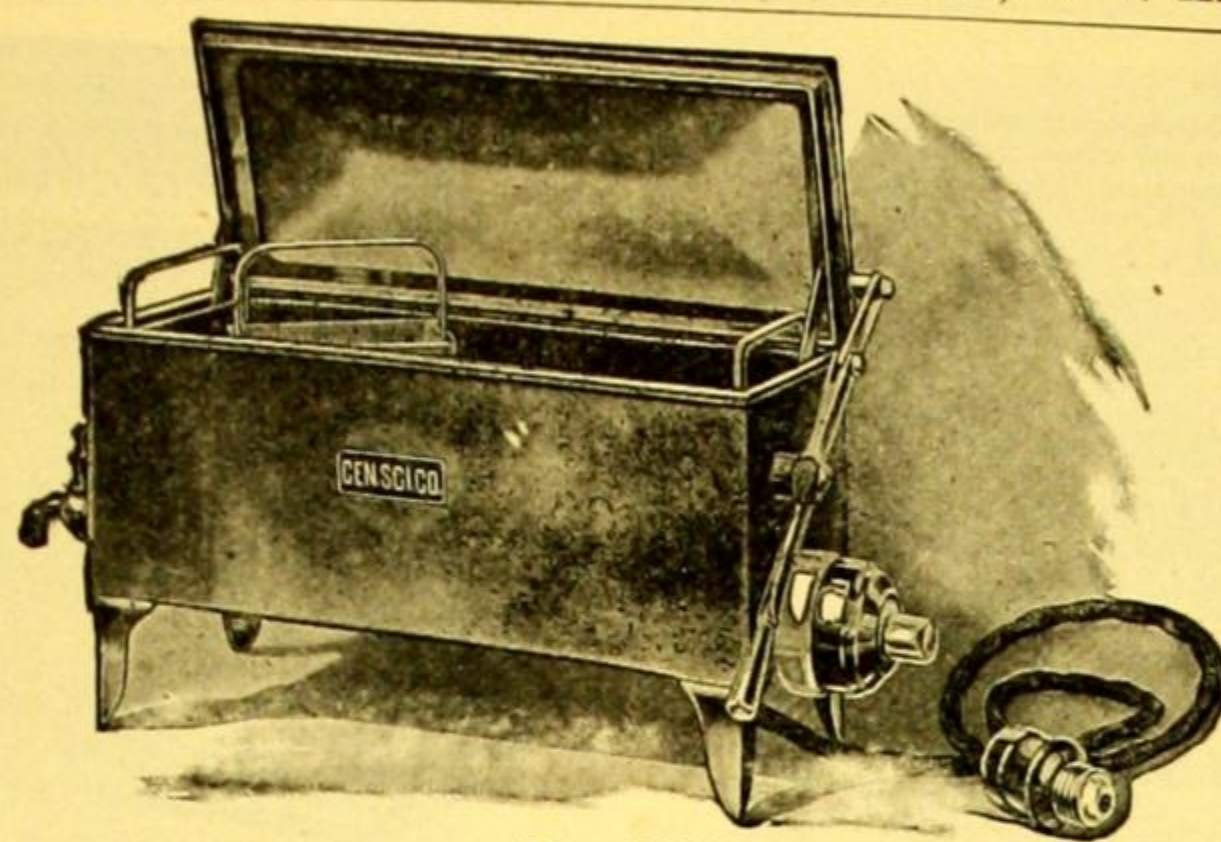
STAINING DISHES, see Dishes, Staining.

STAINING JARS, see Jars, Staining.

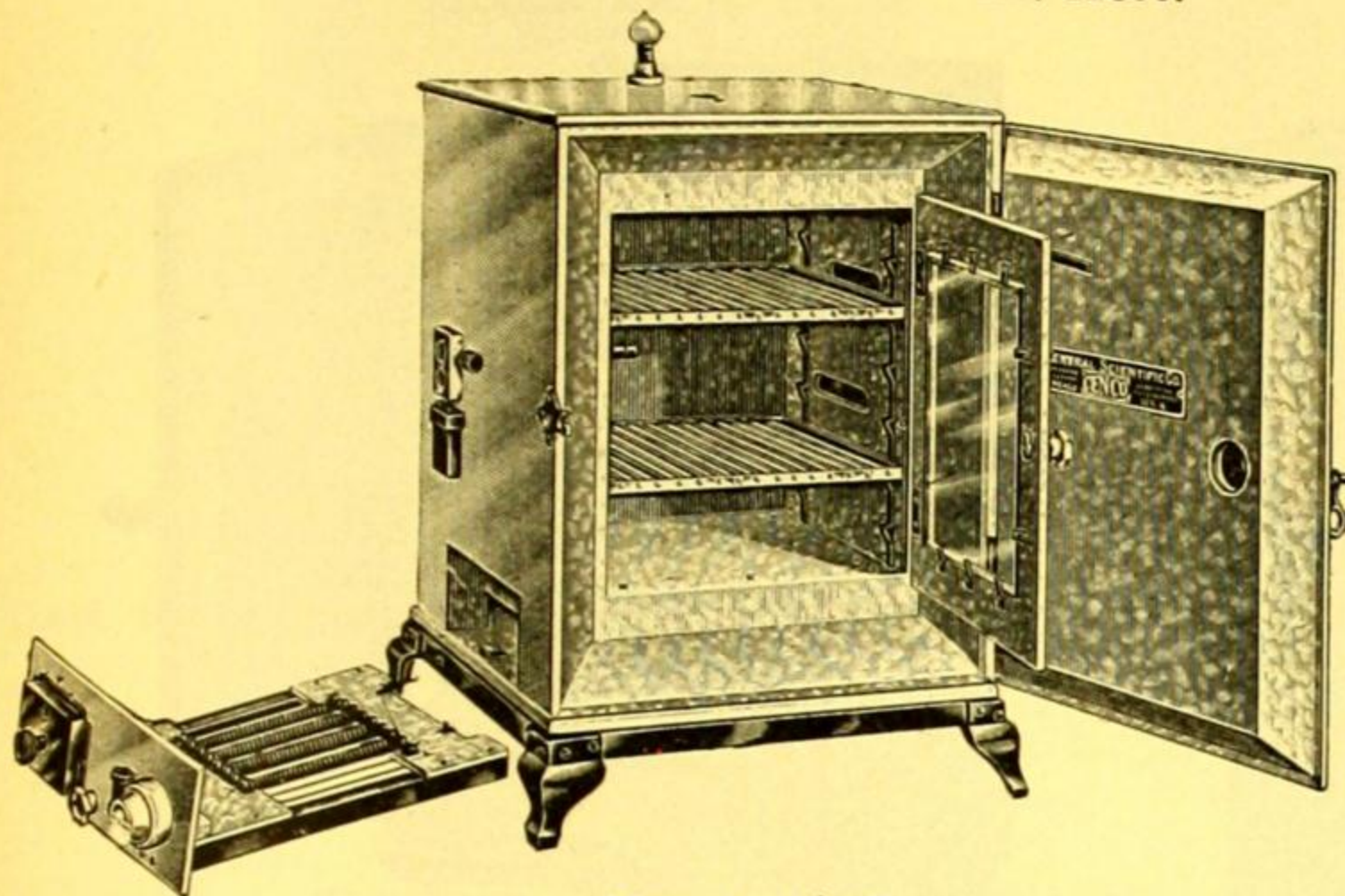
12790. **STENCIL, Cenco, transparent,** for quickly and easily drawing assembled apparatus in student note books prepaid, each .16; prepaid, per dozen 1.75

12794. **STENCIL FIGURES.** Each figure has a beaded lock on its edge so that the figures can be joined together, permitting the use of combinations of figures at one time instead of single figures. Complete set of one-inch numbers from 0-9, dollar mark, cent mark, beginner, ender and period50

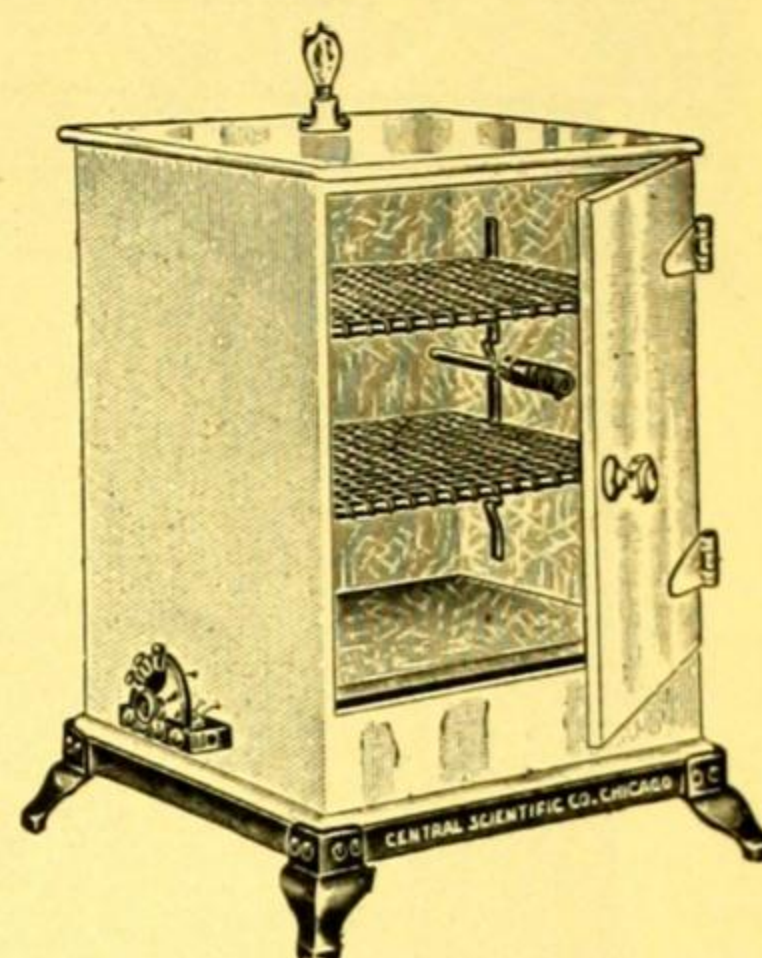
12796. **STENCIL LETTERS.** Same style as No. 12794. Complete set of one-inch letters from A to &, with beginner and ender, period, apostrophe, comma and blank..... 1.10



No. 12800.



Nos. 12816-17.



Nos. 12820-21.

STERILIZERS, ALL KINDS

STERILIZERS, Steam Pressure or Autoclaves, see AUTOCLAVES.

12800. STERILIZER, Instrument, Electrically Heated, with three heats. Made of heavy copper coated inside with pure tin. All parts are heavily nickel-plated. A very desirable feature of this sterilizer is that the hinged cover is opened and the instrument tray is removed from the boiling water by simply pressing down on a nickel-plated brass lever which is always cool. A three point control switch is provided for high, medium and low heats. The sterilizer is provided with an automatic cut-out switch to shut off the electric current before it becomes entirely dry. The water faucet permits cleaning and drawing off of the water without the necessity of disconnecting and carrying the sterilizer to the sink. Can be used either on alternating or direct current. Size, 10½ inches long by 5 inches wide by 3 inches deep. Complete with six feet of attachment cord and connecting plug. \$30.00

STERILIZERS, Hot Air, DeKhotinsky Electrically Heated and Regulated, Triple Wall, constructed to secure uniformity of temperature throughout heated chamber and dependable temperature regulation. Provided with the DeKhotinsky standard system of heating, bimetallic thermo-regulator for temperatures up to 200° C., and with inner glass door for observation of contents. Complete with five feet of cord, receptacle and separable plug for attachment to any lamp socket.

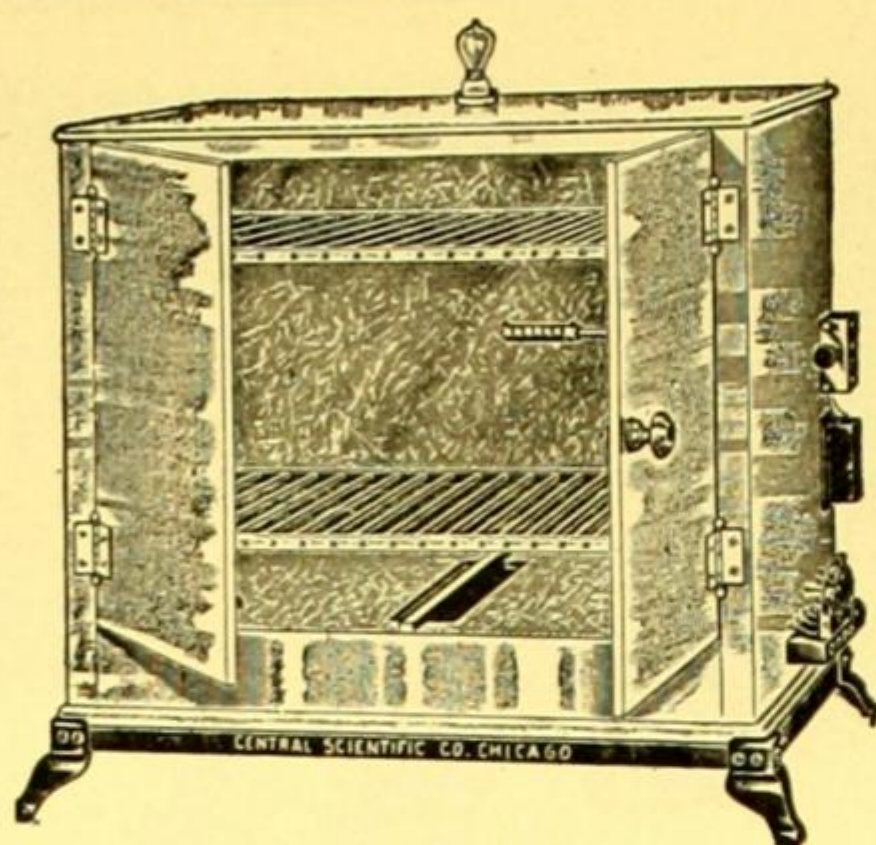
		B	C
No.		14¾x12x11¾	19¾x17x14
Inside dimensions, inches.....		282	476
Shelf space, square inches.....		140.00	220.00
12816. For 110 volts A. C. and D. C.....		140.00	220.00
12817. For 220 volts A. C. and D. C.....			

For full description of construction, heating and ventilating system and temperature control, see No. 7890 INCUBATOR.

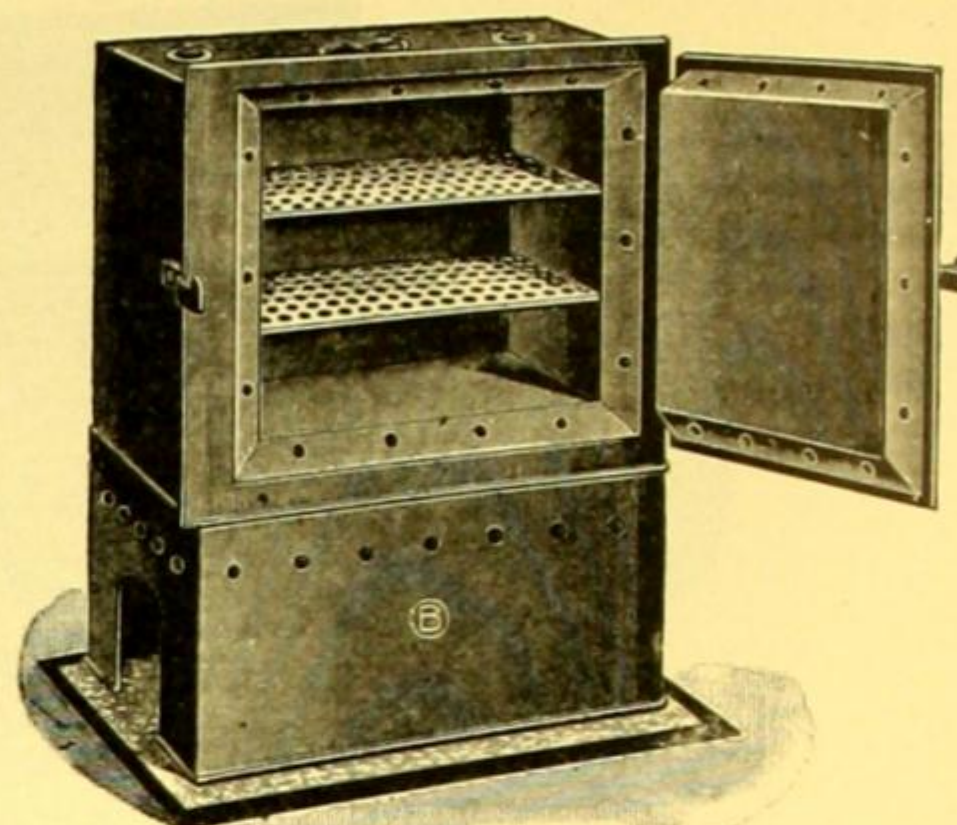
For **EXTRA PILOT LAMPS** for Nos. 12816-7 see Nos. 8197B and 8197C.

STERILIZERS, Hot Air, DeKhotinsky Electrically Heated and Regulated, Single Wall, designed to supply the need for a moderate priced sterilizer with dependable temperature control and uniform temperature throughout. With same system of heating and temperature control as No. 12816, but of simpler construction. For full description see No. 7898 INCUBATOR.

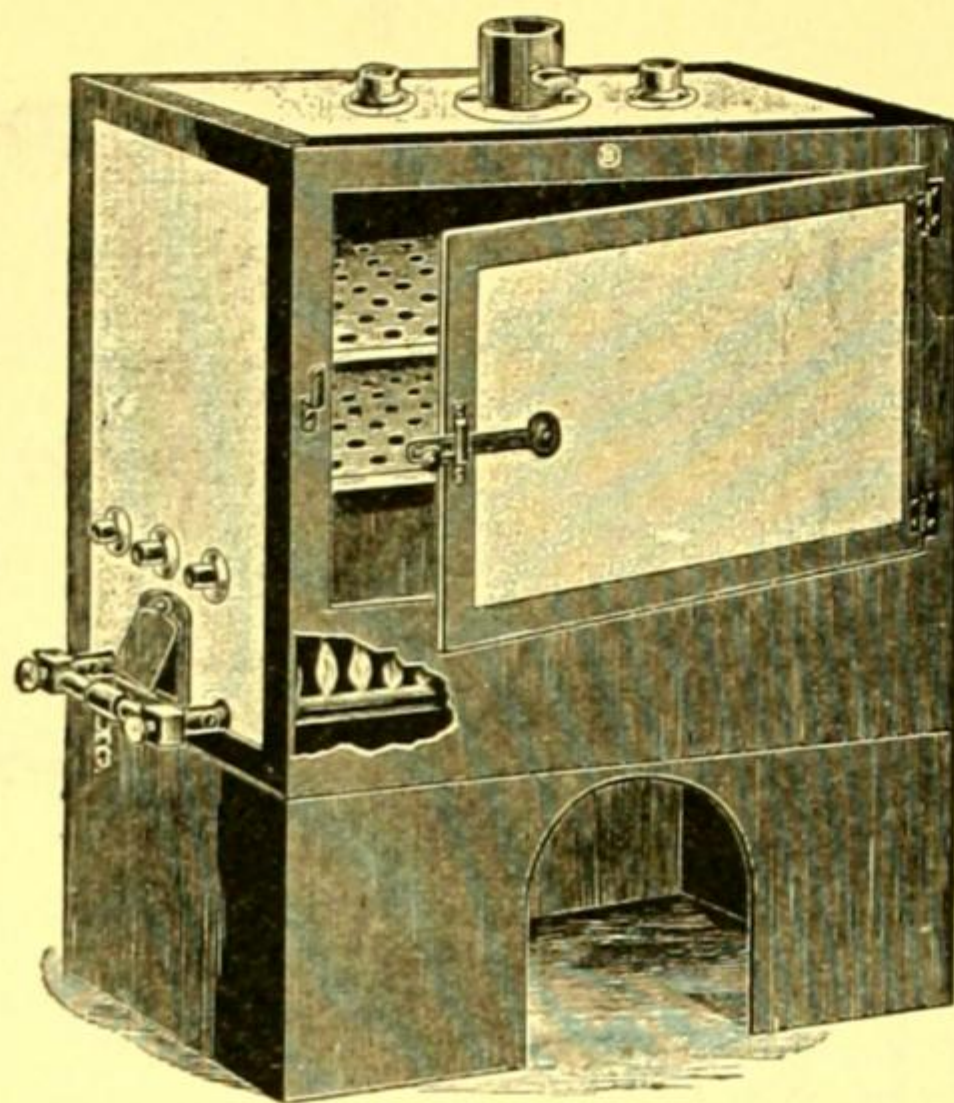
	Width, Inches	Depth, Inches	Height, Inches	Vol. Inside, Cu. Inches	Shelf Space, Sq. Inches	Voltage, A. C. & D. C.	Price
12820.	11	10	12	1320	220	110	50.00
12821.	11	10	12	1320	220	220	50.00



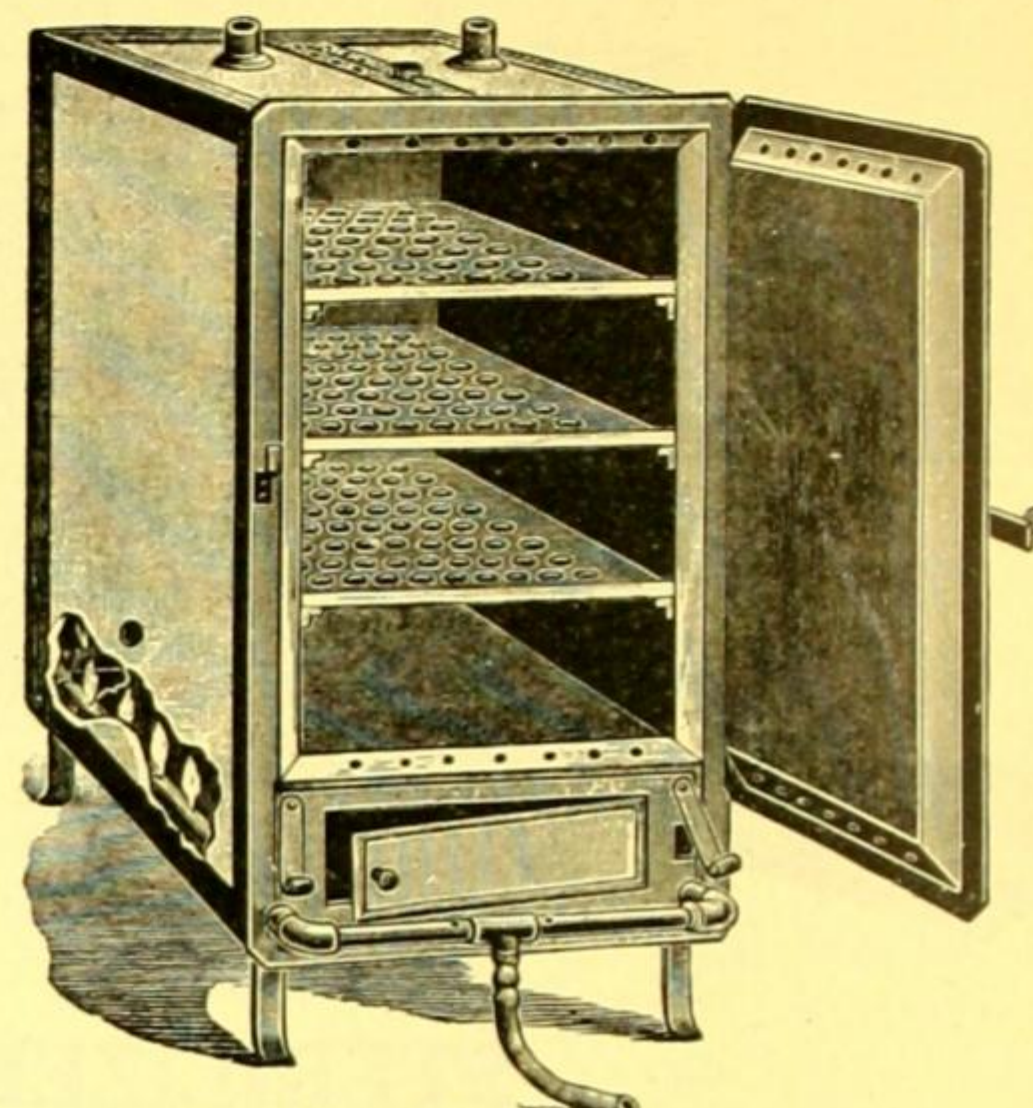
Nos. 12822-23.



No. 12826B.



No. 12827.



No. 12830.

STERILIZERS, Hot Air, DeKhotinsky Electrically Heated and Regulated, Single Wall, of same construction as No. 12820, but larger, with two doors. With same equipment as No. 12820.

	Width, Inches	Depth, Inches	Height, Inches	Vol. Inside, Cu. Inches	Shelf Space, Sq. Inches	Voltage, A. C. & D. C.	Price
12822.	18	12	14	3024	430	110	\$75.00
12823.	18	12	14	3024	430	220	75.00

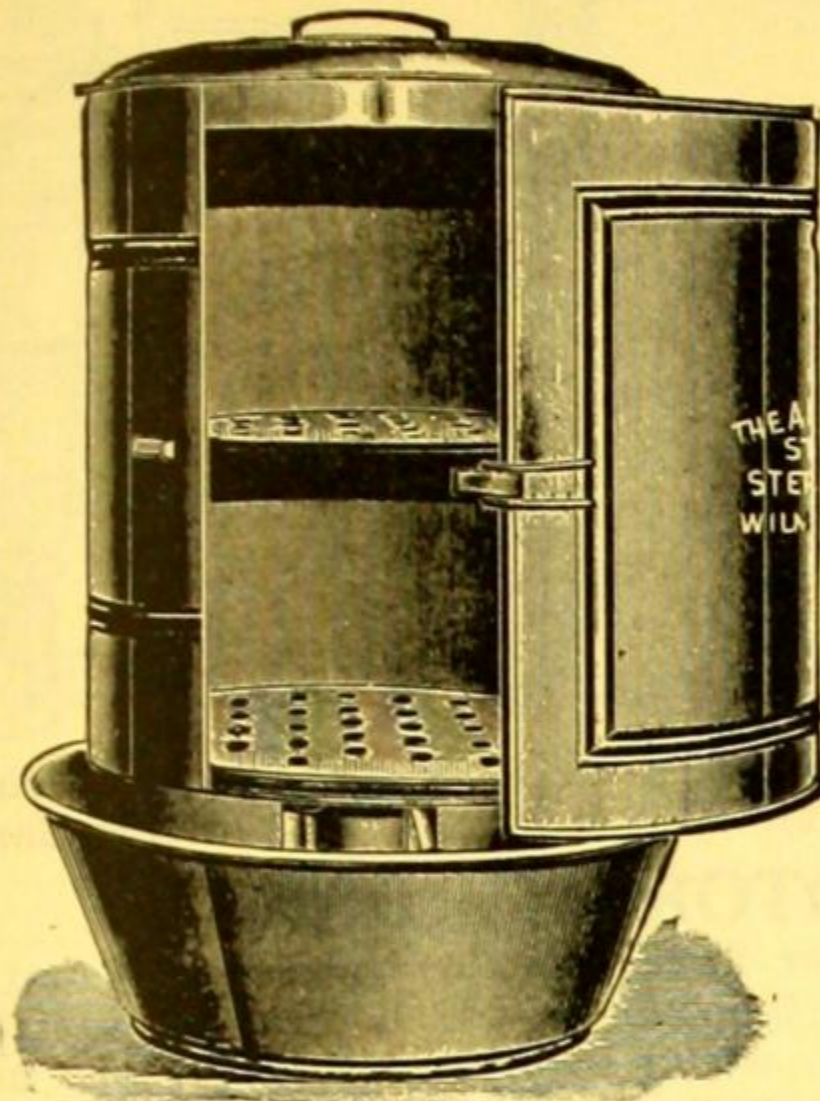
For **EXTRA PILOT LAMPS** for Nos. 12820-23, see Nos. 8197B and 8197C.

12826B. STERILIZER, Hot Air, Double Wall, of sheet iron, with enclosed base, asbestos mat and two perforated shelves. Inside dimensions 10 inches high by 12 inches wide by 10 inches deep; height over all 21½ inches. Without burner. (For BURNERS see Nos. 2108 and 2220.) 21.50

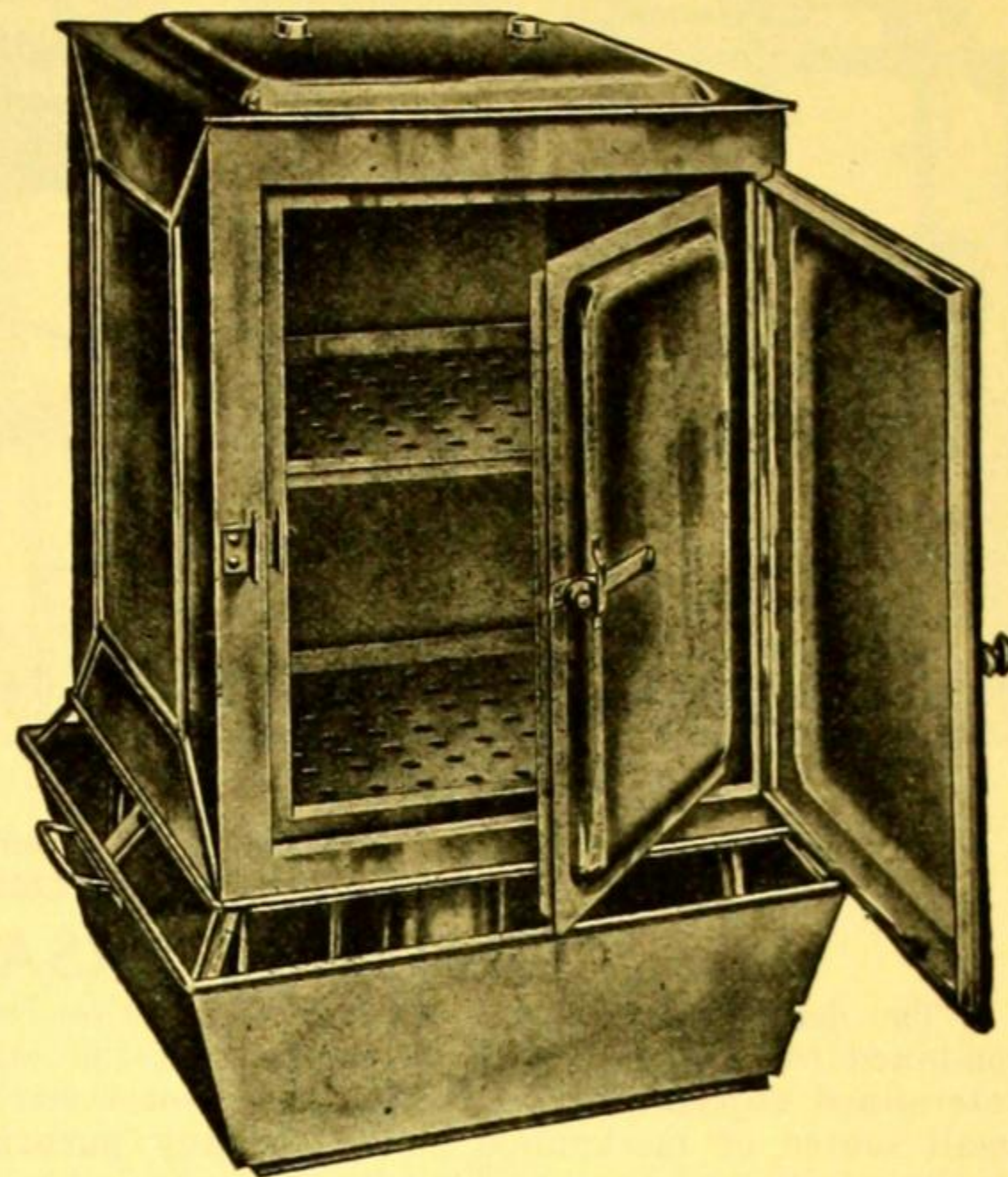
12827. STERILIZERS, Hot Air, Double Wall, U. S. Army Medical Department Model, of sheet iron covered with asbestos, provided with enclosed base, two perforated shelves and built in gas burner with adjustable control valve enabling any kind of gas, including gasoline gas, to be used. Where gas is not available, these sterilizers may be heated by kerosene burners through the openings in the bottom, which are provided with deflecting plates. The sheet iron base is provided to protect the oil burner from drafts. Ventilation is accomplished by means of adjustable sliding ventilators on each end and an adjustable damper in the ventilating chimney at the top. A temperature of from 175° C. to 185° C. can be maintained throughout the sterilizing chamber when heated by either gas or oil. Complete as described, without thermometer. No.....

	A	B	C	D
Height, inches	12	12	18	18
Width, inches	18	18	24	24
Depth, inches	9	9	14	14
Equipped for	gas	gas & oil	gas	gas & oil
Number of kerosene burners supplied.....	0	1	0	2
Each	41.00	45.25	57.50	67.50

12830. STERILIZER, Hot Air, Double Wall, High Form, for gas only, made of sheet iron covered with asbestos. The instrument is heated by a row of small gas flames around the sides of the base, insuring an even circulation of heat. The air is introduced through openings in the sides and its rate of flow controlled by a sliding ventilator in the top. Dimensions inside, 19 inches high by 12 inches wide by 9½ inches deep. Complete with three perforated shelves but without thermometer. 41.00



Nos. 12846-7.



No. 12850.

12846. **STERILIZERS, Arnold Steam, Cylindrical Form**, with side door, hood, two removable perforated shelves and quick steaming base. These sterilizers are adaptable to any form of heating and require very little attention when in use. The special construction of the base is such that only a very thin layer of water is kept boiling causing the steam, which is formed rapidly, to rush into the sterilizing chamber under a slight pressure at the temperature of boiling water. Water from the upper chamber in the base is automatically supplied to boiling chamber. The steam after escaping from the sterilizing chamber passes into the space between the walls of this chamber and the hood and is forced down, coming in contact with the air just above the water reservoir, where it condenses and drips back to be used again. Constructed of heavy tin, with copper bottom. Complete without burner.

No.	A	C	D
Height inside, inches.....	7 $\frac{1}{8}$	11 $\frac{3}{4}$	12 $\frac{1}{2}$
Diameter inside, inches.....	8 $\frac{1}{2}$	10 $\frac{1}{8}$	10 $\frac{7}{8}$
Each	\$10.50	12.60	14.40

12847. **STERILIZER, Arnold Steam, Cylindrical Form**, same as No. 12846, but made entirely of heavy polished copper. Complete without burner.

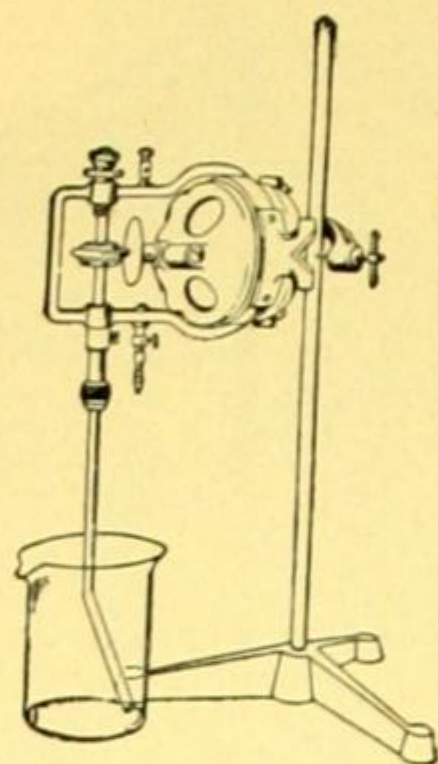
No.	C	D
Height, inches	11 $\frac{3}{4}$	12 $\frac{1}{2}$
Diameter, inches	10 $\frac{1}{8}$	10 $\frac{7}{8}$
Each	31.50	33.25

12850. **STERILIZERS, Arnold Steam, Boston Board of Health Pattern**. Made of heavy polished copper, with double walls, double doors, two removable perforated shelves and quick steaming base operating in the same manner as in the Arnold Sterilizers No. 12846. The square shape and double door feature is a distinct convenience and has enabled this type of steam sterilizer to enjoy a very wide popularity. The largest size is divided into two compartments, each being provided with a separate set of double doors. Complete without burner.

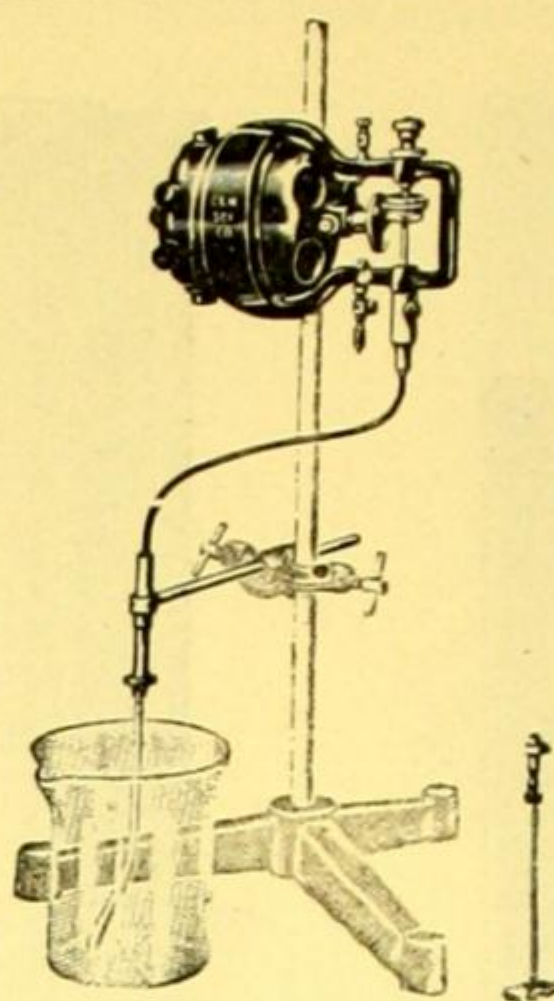
No.	A	B	C	D
Height inside, inches.....	14 $\frac{3}{4}$	15 $\frac{1}{4}$	19 $\frac{1}{2}$	15 $\frac{1}{2}$
Width inside, inches.....	8 $\frac{3}{4}$	12 $\frac{1}{4}$	16 $\frac{1}{2}$	24 $\frac{1}{2}$
Depth inside, inches.....	9	12 $\frac{1}{4}$	14 $\frac{1}{2}$	12 $\frac{1}{4}$
Each	67.50	73.00	121.50	144.00

12851. **Base, Enclosed Sheet Iron**, for No. 12850 Sterilizers. A considerable convenience in laboratories using individual burners as a source of heat. Prevents irregular operation due to influence of drafts on the burner flame.

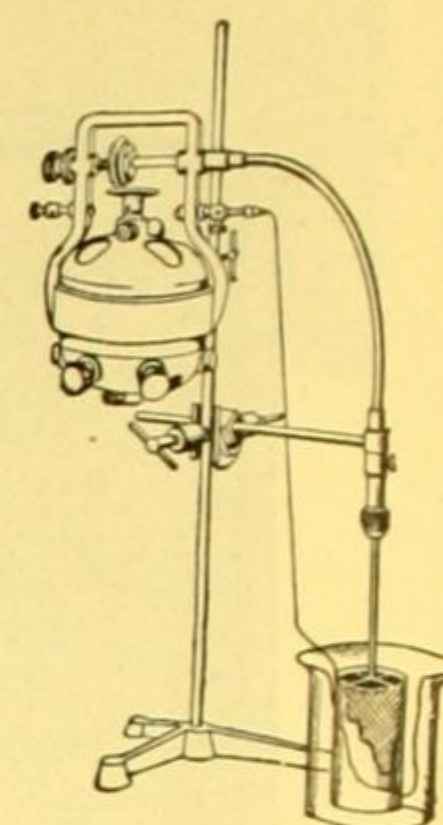
No.	A	B	C	D
For sterilizer No.....	12850A	12850B	12850C	12850D
Each	4.00	4.00	5.00	6.00



Direct Stirring.



No. 12860 (Shown in Operation with Flexible Shaft).



As Anode Rotator with Flexible Shaft.

CENCO UNIVERSAL MOTOR STIRRER

The design of the Cenco Universal Friction-Drive Motor Stirrer is the result of several years of combined thought and work on the part of the sales force, laboratory and shop to accomplish the predetermined object—the production of a motor stirrer which would fulfill **every laboratory need** for a small source of mechanical power **for any purpose whatsoever**. In this work we have been guided by the advice and have profited by the practical tests made by the various branches of the Chemistry Department of the University of Illinois, to whom we wish to express our appreciation.

The Cenco Universal Friction-Drive Motor Stirrer is made with the speed control mechanism and clamp holder mounted directly on the motor frame, making a compact unit. The motor has been selected after extended tests upon fractional horse-power motors of various makes, as the most serviceable type obtainable for this purpose.

The speed control mechanism is of the friction disk type, used commercially for many purposes such as drill presses, but not previously employed for speed regulation of laboratory motors. It permits a variation of speed from zero to the maximum number of revolutions per minute of the motor, about 3000. The change is easily and quickly effected, while the motor is running, by turning the knurled thumb-screw, which causes the friction disk on the stirrer spindle to move across the face of the metal rheostat controlled motors, there is consequently no loss of energy input, as in the case of rheostat controlled motors, there is consequently no loss of power as the speed is reduced. This overcomes the chief objection to small motor stirrers commonly employed in chemical laboratories.

In order to make the outfit as universally applicable as possible, it has been provided with a specially designed right-angle clamp holder, by means of which the stirrer may be clamped on any laboratory support stand with rods from 10 to 19 mm and may be held with the motor either horizontal or vertical.

By means of the flexible shaft and guide, shown in the illustration, the motor may be swung to one side, out of the way of conflicting apparatus or out of range of corrosive fumes.

To provide for the use of this stirrer for rotating anodes in electrolytic analysis, binding posts are mounted on the yoke at convenient locations for connection to the source of current. The one at the top is grounded through the frame to the rotating spindle, through which the current passes to the rotating anode. Connection to the cathode is made by means of the binding post mounted on the under side of the yoke, which is insulated from the frame. This binding post is of the split chuck type, permitting the attachment wire of the cathode to be clamped quickly and firmly.

Two chucks are provided for use on the rotating spindle, one for wires and the other for rods. Both are of the split chuck type, permitting rapid and firm attachment. The smaller one will take wires from No. 12 to No. 18 B. & S. gage, and is intended for use with rotating anodes. The larger chuck will hold firmly glass rods varying from 15/64 to 17/64 inch in diameter.

A small pulley is mounted on the spindle of the stirrer, from which power may be transmitted by means of small cord belts to other laboratory devices, as illustrated on the next page.

Specifications:

Weight, 4 pounds.

Length over all, 6 inches.

Maximum speed, about 3000 r. p. m.

Minimum speed, 0 r. p. m.

Power consumed on full load, 20 watts (1/40 h. p.)

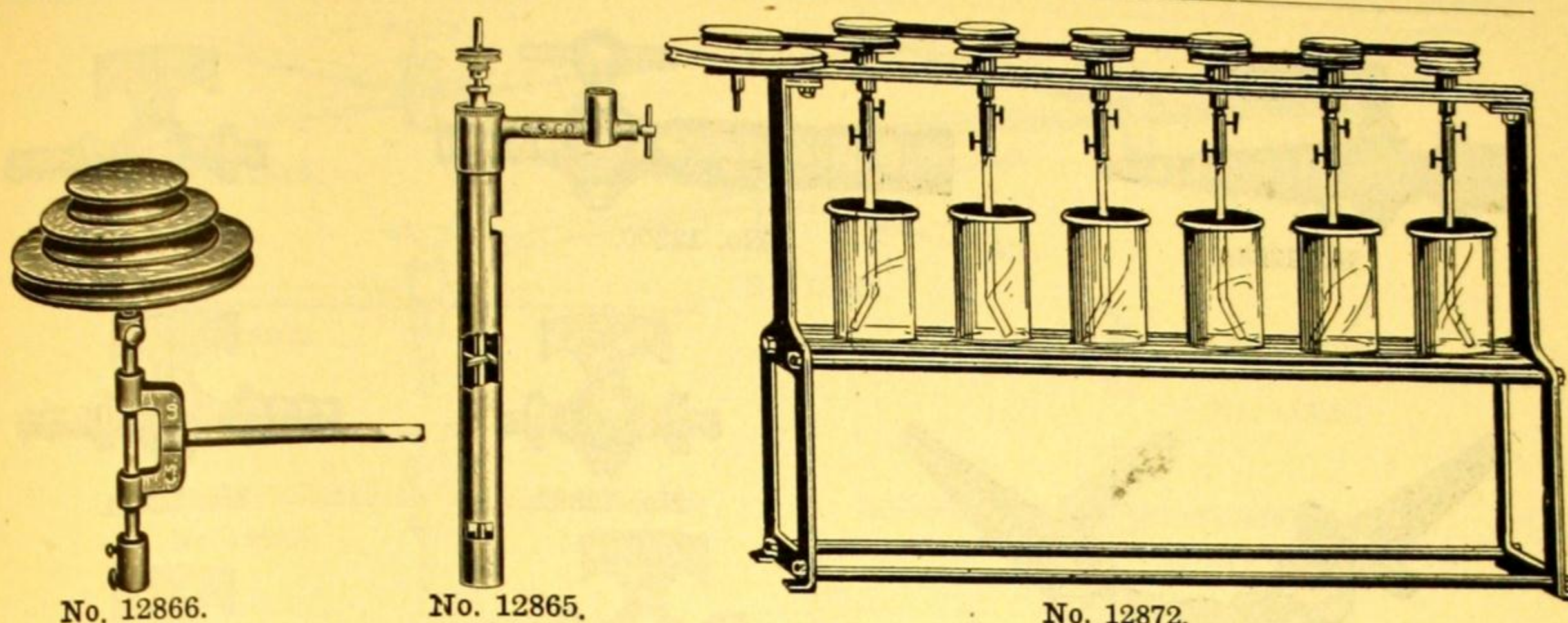
For support rods of diameters, 10 to 19 mm.

Length of flexible shaft, 12 inches.

12860. **CENCO FRICTION DRIVE UNIVERSAL MOTOR STIRRER**, complete as described above, with connecting cord and attachment plug but without support stand, flexible shaft and guide, or stirring rod.

No.

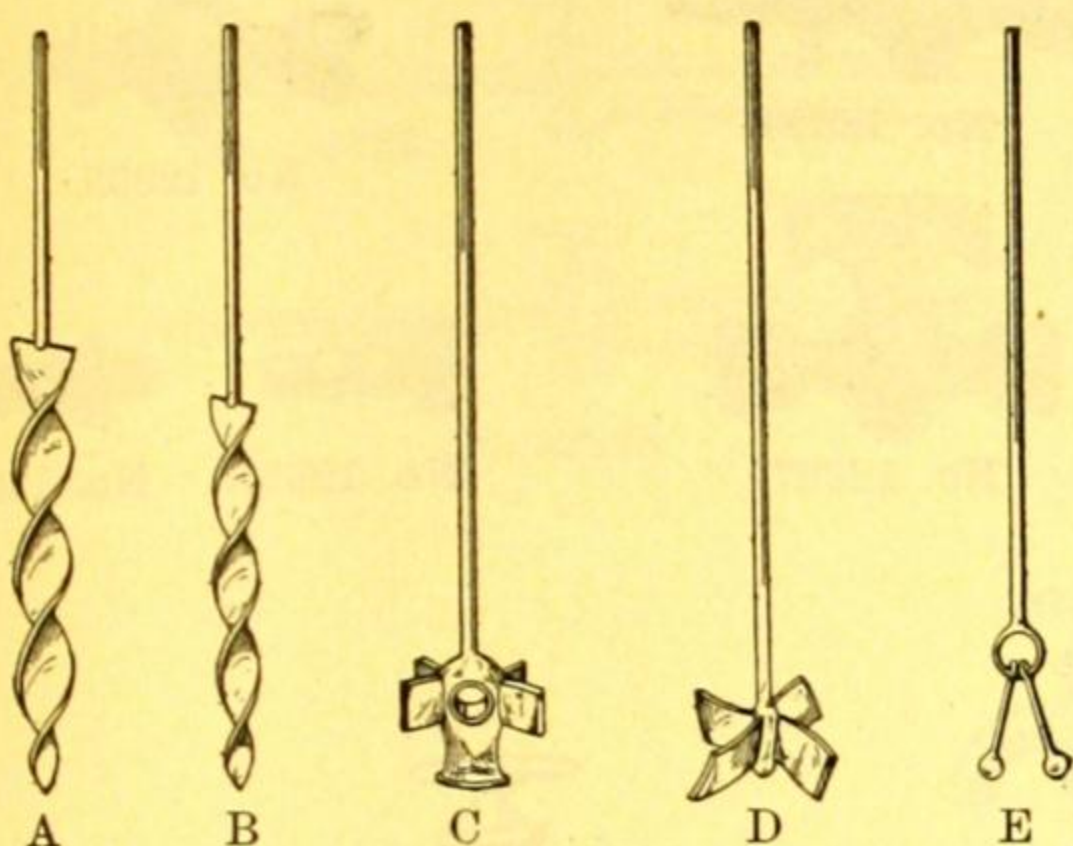
	A	B	C	D
For volts	A.C.			
Each	110	220	110	220
12861. Flexible Shaft, 12 inches long, for use with No. 12860, with guide to provide bearing for lower end. Can be attached to support by any ordinary right angle clamp (see our No. 2914)	\$35.00	37.00	35.00	37.00
Note:—For complete description of No. 12860, send for Bulletin 85.				4.00



No. 12866.

No. 12865.

No. 12872.



A

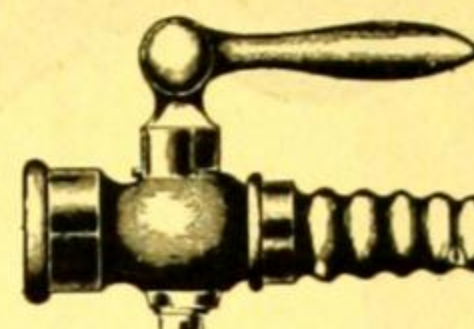
B

C

D

E

No. 12868.



No. 12882.

STIRRING APPARATUS

12865. **STIRRERS, High Speed Turbine**, for use in water baths, etc., where rapid stirring must be maintained. They are compact and efficient, operating without noise or violent disturbance of the water. Especially adapted for use in thermostats, in physical chemistry laboratories.

No.	A	B
Length, inches.....	10	12
Diameter, inches.....	$\frac{7}{8}$	$1\frac{1}{4}$
Capacity, liters per minute.....	5	8
Power required to operate, h. p.....	$\frac{1}{16}$	$\frac{1}{12}$
Each	\$12.00	12.00

12866. **STIRRING APPARATUS**, consisting of a three step cone pulley with chuck for holding glass stirring rods, mounted in bracket with rod for attachment to support stand. Diameter of largest pulley, $3\frac{1}{2}$ inches. For rods up to $\frac{1}{4}$ inch..... 5.50

12868. **STIRRING RODS**, of glass for use with No. 12866.

Style	A	B	C	D	E
Each	1.00	1.00	1.60	1.60	1.80

12872. **STIRRING APPARATUS, Blair's**, as used in iron analysis. Complete with stirrers, asbestos plate, 6 beakers and covers, without motor..... 40.00

STIRRING RODS, see Glass Rods.

STILLS, see Distilling Apparatus.

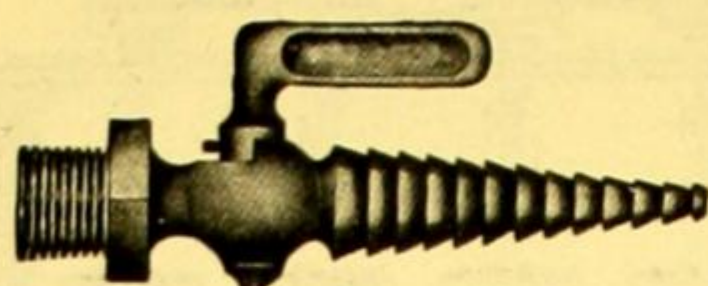
STOP-COCKS, ALL KINDS

12880. **STOP-COCKS, Brass**, for gas, nickel-plated, with long taper hose end for $\frac{1}{4}$ to $\frac{3}{8}$ inch rubber tubing; male thread for attaching to gas pipe coupling. Not for water.

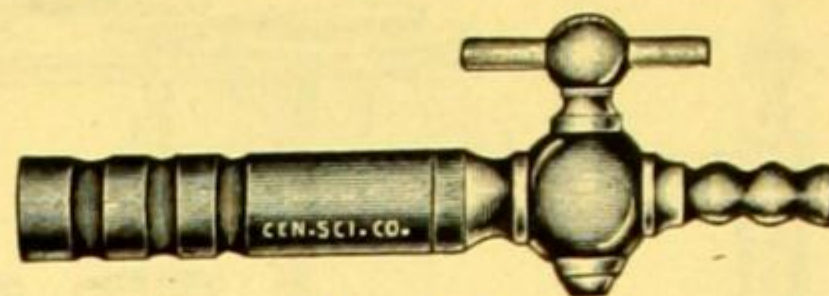
	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Diameter of gas pipe inside, inches.....	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Size of I. P. thread, inches.....	.55	.50	.60
Each			

12882. **STOP-COCKS, Brass**, for gas, same as No. 12880, but with female thread for attaching to gas pipe.

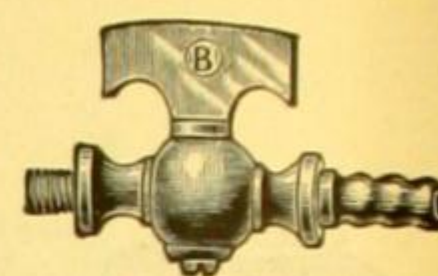
	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Diameter of gas pipe inside, inches.....	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Size of I. P. thread, inches.....	.45	.50	.60
Each			



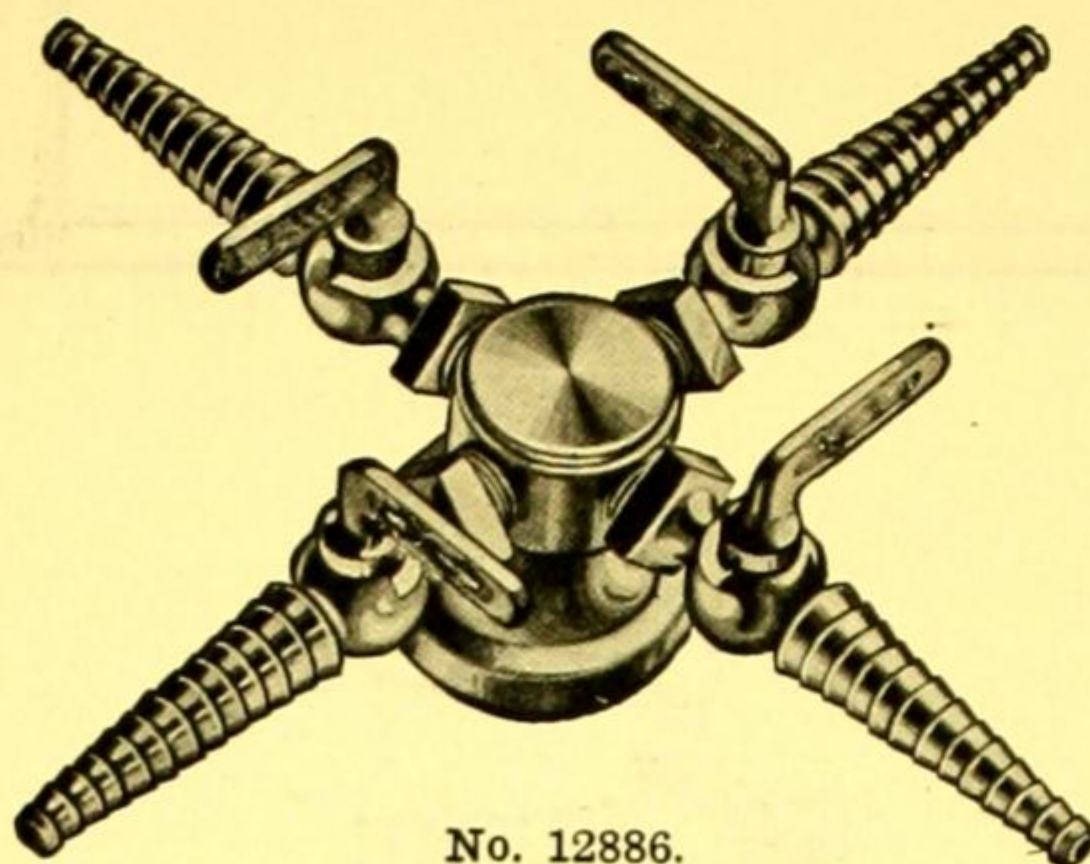
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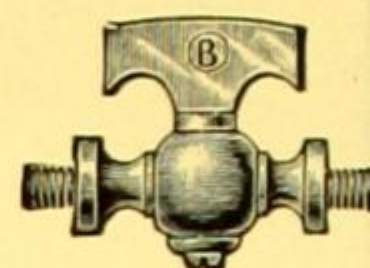
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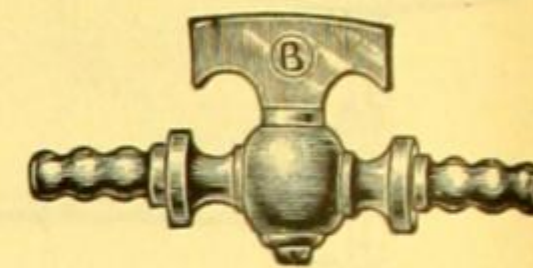
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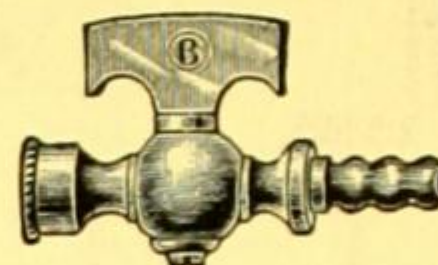
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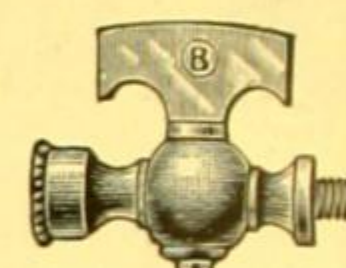
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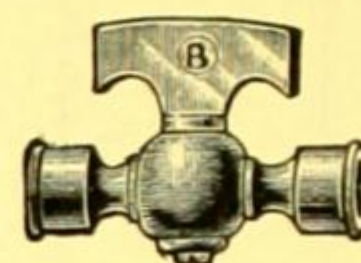
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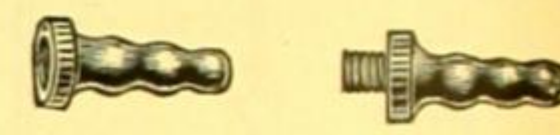
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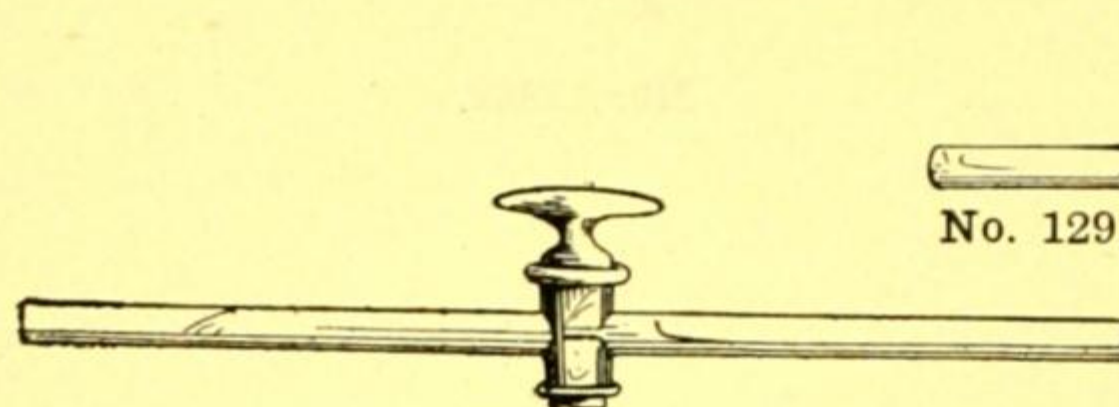
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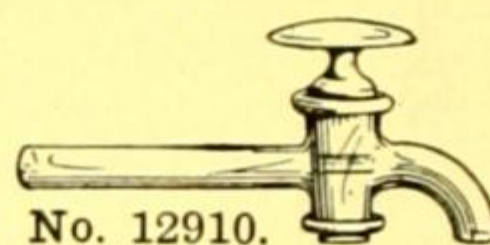
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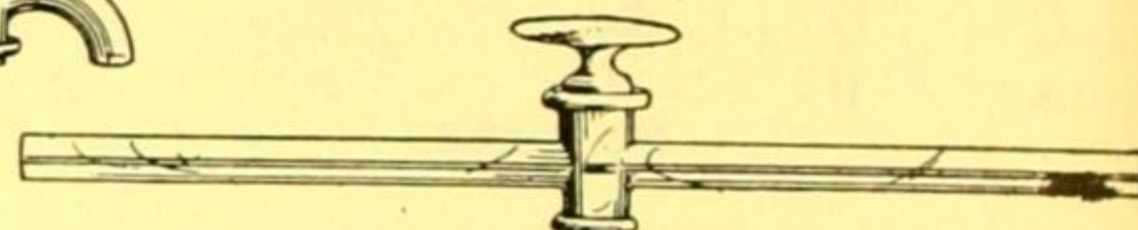
No. 12890. No. 12891.



No. 12908.



No. 12910.



No. 12913.

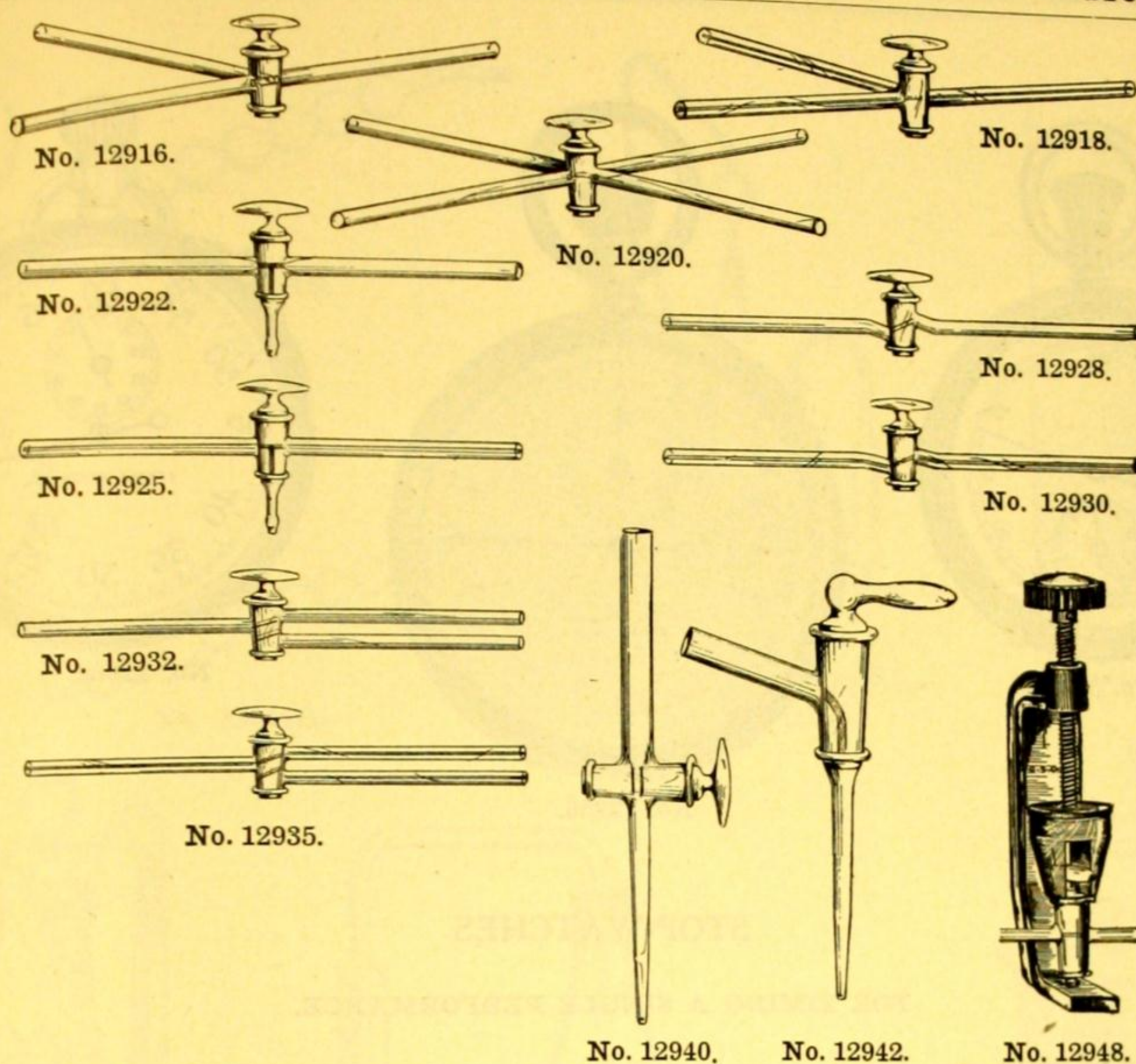
12884. **STOP-COCK**, Brass, for gas, single, nickel-plated. Especially suited for laboratory use. The nipple is $2\frac{1}{2}$ inches long, tapering from $\frac{5}{8}$ inch diameter at the valve to $\frac{1}{4}$ inch diameter at the end. The serrations prevent rubber tubing from slipping off. With $\frac{3}{8}$ inch iron pipe male thread \$0.90
12885. **STOP-COCK**, Brass, two-way, consisting of two No. 12884 Single Stop-Cocks, with flange. 2.50
12886. **STOP-COCK**, Brass, four-way, consisting of four No. 12884 Single Stop-Cocks, with flange. 6.00

STOP-COCKS AND NIPPLES FOR AIR PUMPS.

The following nipples and stop-cocks are accurately made of brass, polished and lacquered, and in order that they may be capable of the greatest service in the laboratory we have not threaded them for use with iron pipe fittings, but have used the same threads as are used on all our Air Pump Plates and Air Pump Accessories ($\frac{7}{16}$ -inch in diameter and 16 threads to the inch). Stop-cocks are $\frac{1}{8}$ inch bore; nipples, $\frac{3}{16}$ inch bore.

12890.	NIPPLE , of brass, female screw.....							.35
12891.	NIPPLE , of brass, male screw.....							.35
12892.	STOP-COCK , double male screw.....							.80
12893.	STOP-COCK , one end for tubing, the other with male screw.....							.80
12894.	STOP-COCK , both ends for tubing.....							.80
12895.	STOP-COCK , one male and one female screw							1.10
12896.	STOP-COCK , one end for tubing, the other with female screw.....							1.25
12897.	STOP-COCK , both ends with female screws.....							1.50
12900.	STOPCOCK , Brass, for No. 6720 Gas Bags. One end for attaching rubber tubing, the other a $\frac{5}{8} \times 2\frac{1}{2}$ -inch brass tube for nozzle of gas bag							1.10
12908.	STOP-COCKS , Glass, straight.							
	Bore, mm	1	2	3	4	5	6	8
	Each	.90	.90	1.00	1.15	1.35	1.90	2.25
12910.	STOP-COCKS , Glass, same as No. 12908, with curved outlet for aspirator bottles, etc.							
	Bore, mm					2	3	4
	Each					1.00	1.15	1.25
12913.	STOP-COCK , Glass, same as No. 12908, but with capillary tubes for use in gas analysis apparatus, etc. Outside diameter of tube, 6 to 7 mm. Bore of stopper, $1\frac{1}{2}$ mm.....							1.15

10% discount in lots of 10; 20% discount in lots of 100 on Nos. 12908-12913.



12916. STOP-COCKS, Glass, three-way lamp blown form.

Bore of stopper, mm.....	2	4
Each	\$1.70	2.80

12918. STOP-COCK, Glass, same as No. 12916, but with capillary tubes. Bore of stopper, 1½ mm 2.00

12920. STOP-COCK, Glass, four-way. Bore of stopper, 2 mm..... 2.25

12922. STOP-COCK, Glass, three-way, with downward outlet through stop-cock plug. Bore of stopper, 2 mm 1.80

12925. STOP-COCK, Glass, three-way, same as No. 12922, but with capillary tubes. Bore of stopper, 1½ mm 2.25

12928. STOP-COCKS, Glass, two-way with plug bored at an angle.

Bore of stopper, mm	2	4
Each	1.15	1.40

12930. STOP-COCK, Glass, two-way, same as No. 12928, but with capillary tubes. Bore of stopper, 1½ mm 1.35

12932. STOP-COCKS, Glass, three-way, with plug with two holes bored at an angle, and with two outlets on one side.

Bore of stopper, mm.....	2	4
Each	1.70	2.80

12935. STOP-COCK, Glass, three-way, same as No. 12932, but with capillary tubes. Bore of stopper, 1½ mm 2.00

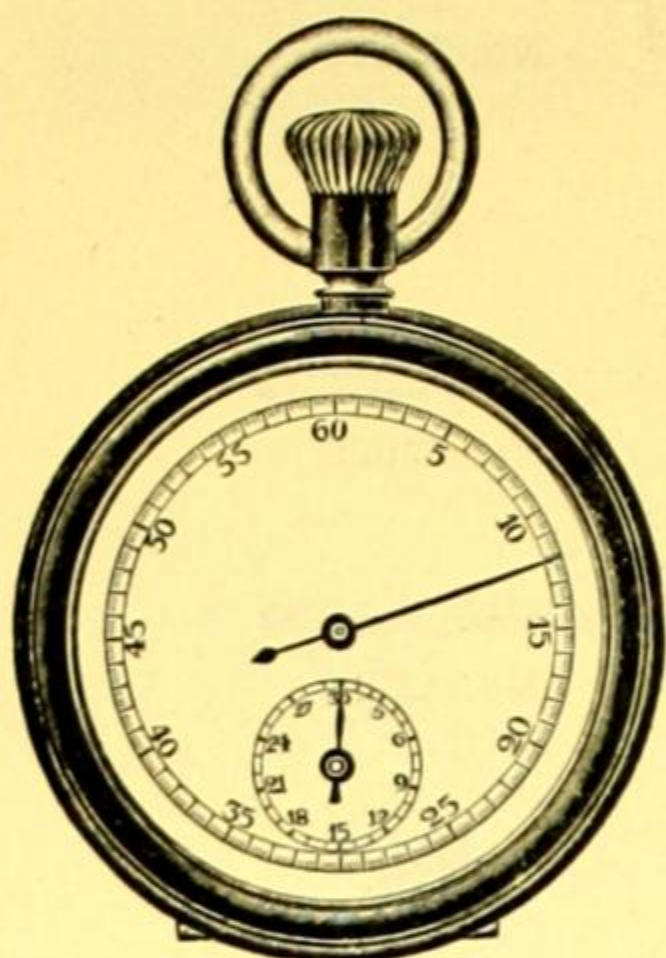
12940. STOP-COCK, Glass, Burette, with outlet drawn to a tip, for attaching to burettes. Bore of stopper, 2 mm..... .90

12942. STOP-COCK, Glass, Fresenius form, for burette tips. With inlet tube bore, 5 mm; outlet bore, 2 mm 2.00

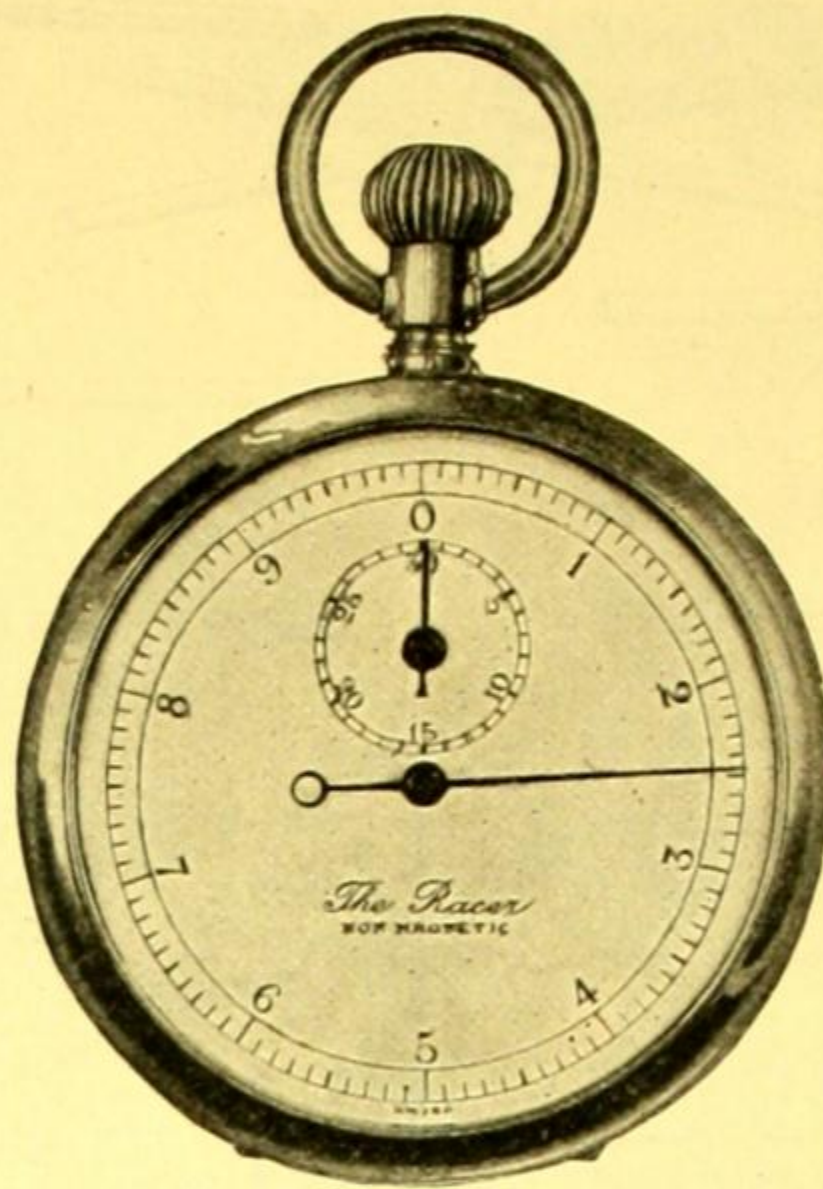
10% discount in lots of 10, 20% discount in lots of 100 on Nos. 12916-12942.

12946. STOP-COCK GREASE, for lubricating and preventing leakage. Heavier and more resistant to reagents than vaseline.....per ounce bottle .35

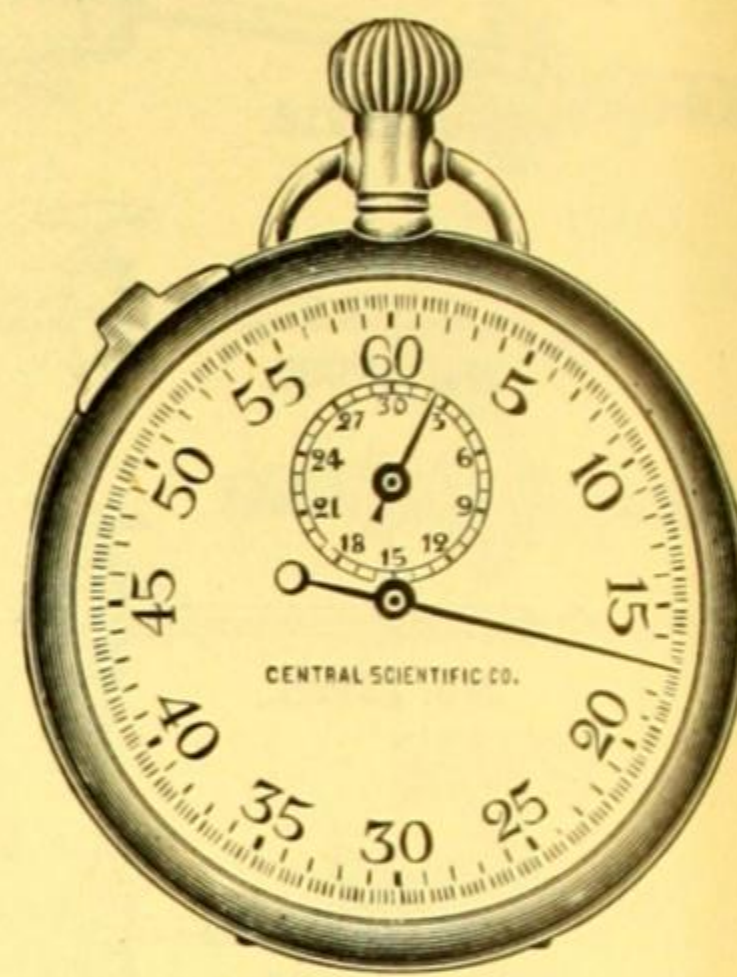
12948. STOP-COCK REMOVER, for removing frozen stop-cock plugs from stop-cocks in any type of apparatus. The instrument consists essentially of a cast manganese-bronze frame holding a bakelite tip for bearing against the bottom surface of the plug; and a wooden receptacle of proper size, adjusted by means of a phosphor-bronze screw, to press against the stop-cock body. A receptacle of proper size is selected, attached to the disk, seated properly, and pressure applied by turning a vulcanite knob until the plug is ejected. Complete with four receptacles for various sizes of stop-cocks..... 5.00



No. 12954.



No. 12956.



No. 12962.

STOP-WATCHES

FOR TIMING A SINGLE PERFORMANCE.

12954. **STOP-WATCH, Ordinary Design.** Nickeled case, stem wind, lever escapement, $\frac{1}{5}$ second divisions. Convenient for testing and experimental work, being non-magnetic..... \$12.75
12956. **STOP-WATCH, Decimal Design.** The minute is divided into 100 parts so that the watch is very useful in all timing operations in which the minute is the unit of time. Readable to $\frac{1}{3}$ of a division, i. e., $\frac{1}{300}$ minute. Otherwise same as No. 12954 described above..... 13.25

FOR TIMING TWO EVENTS WHICH START SIMULTANEOUSLY BUT END AT DIFFERENT TIMES.

12960. **STOP-WATCH.** Nickeled case, stem wind, lever escapement, $\frac{1}{5}$ second divisions, non-magnetic, provided with two hands for timing two events which start simultaneously but end at different times. Useful in timing laboratory operations, and in timing first and second places in a race. Has a higher grade movement than No. 12954 30.00

FOR TIMING AN INTERRUPTED PERFORMANCE.

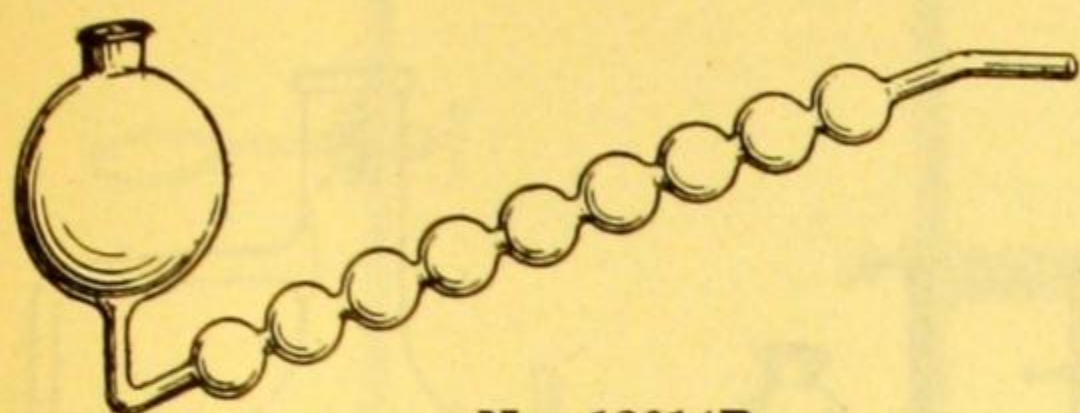
12962. **STOP-WATCH.** Nickeled case, stem wind, lever escapement, 7 jewels, $\frac{1}{5}$ second divisions, non-magnetic. This watch is operated by moving a "side piece" instead of pushing the "crown." This method is easier on the mechanism, giving the watch much longer life. It also operates more smoothly than the old style and will record the time of an interrupted performance, giving exactly the time used for the performance itself, excluding the interruption. The hands will come back to their original starting point only by pushing the "crown"..... 14.50

For **T-SQUARES**, see general heading Drawing Instruments.

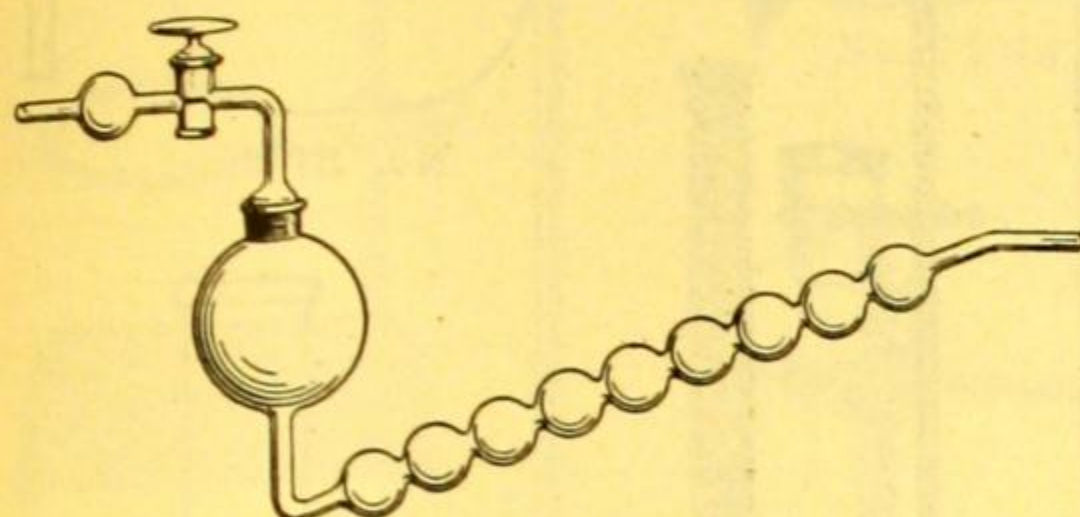
STREAK PLATES, see Arsenic Plates.

STROPS, Razor, see Microtome Accessories.

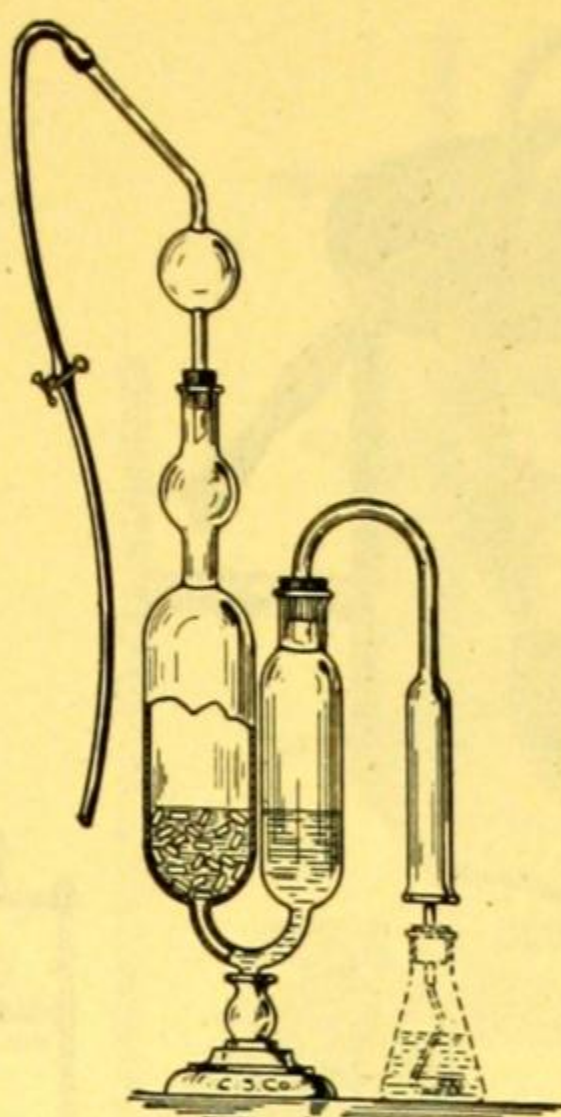
SUBERITE RINGS, see Cork Rings.



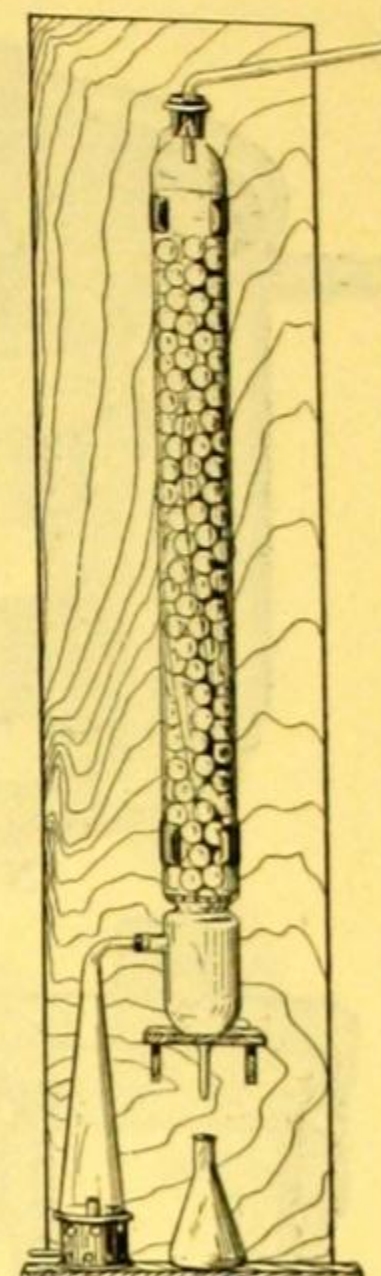
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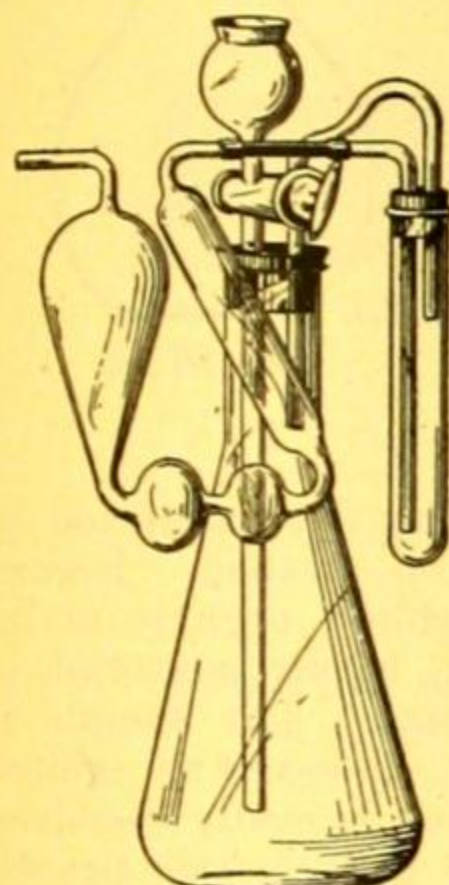
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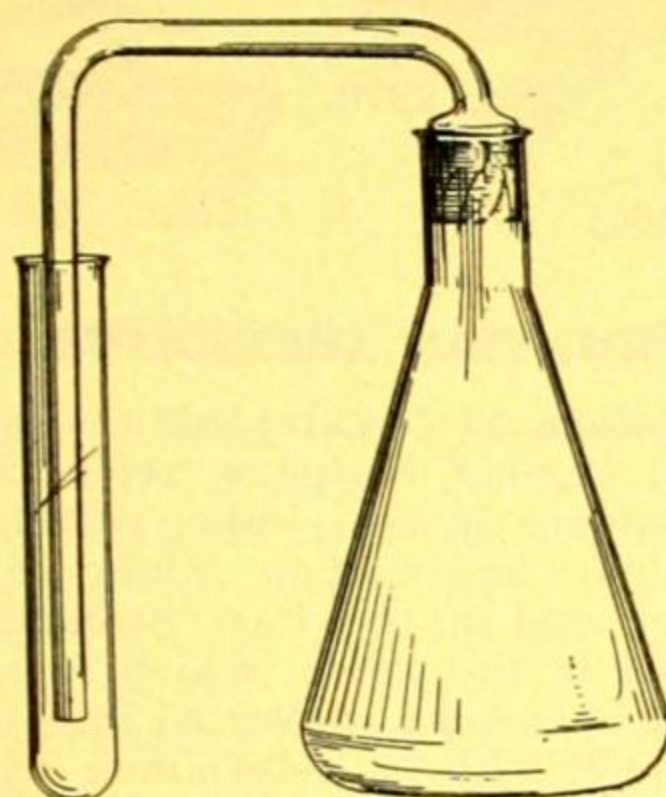
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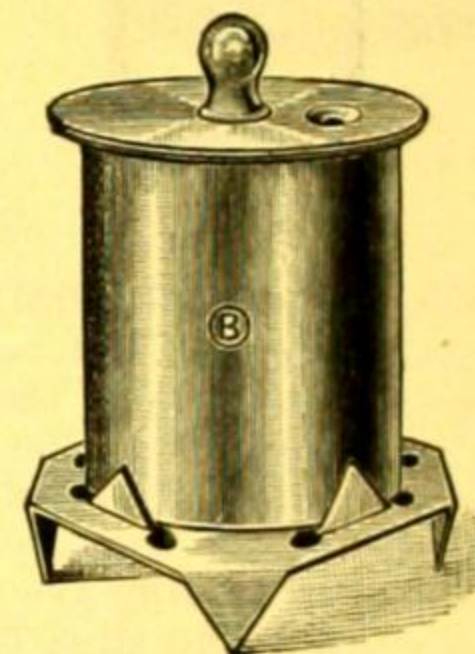
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No. 13024.



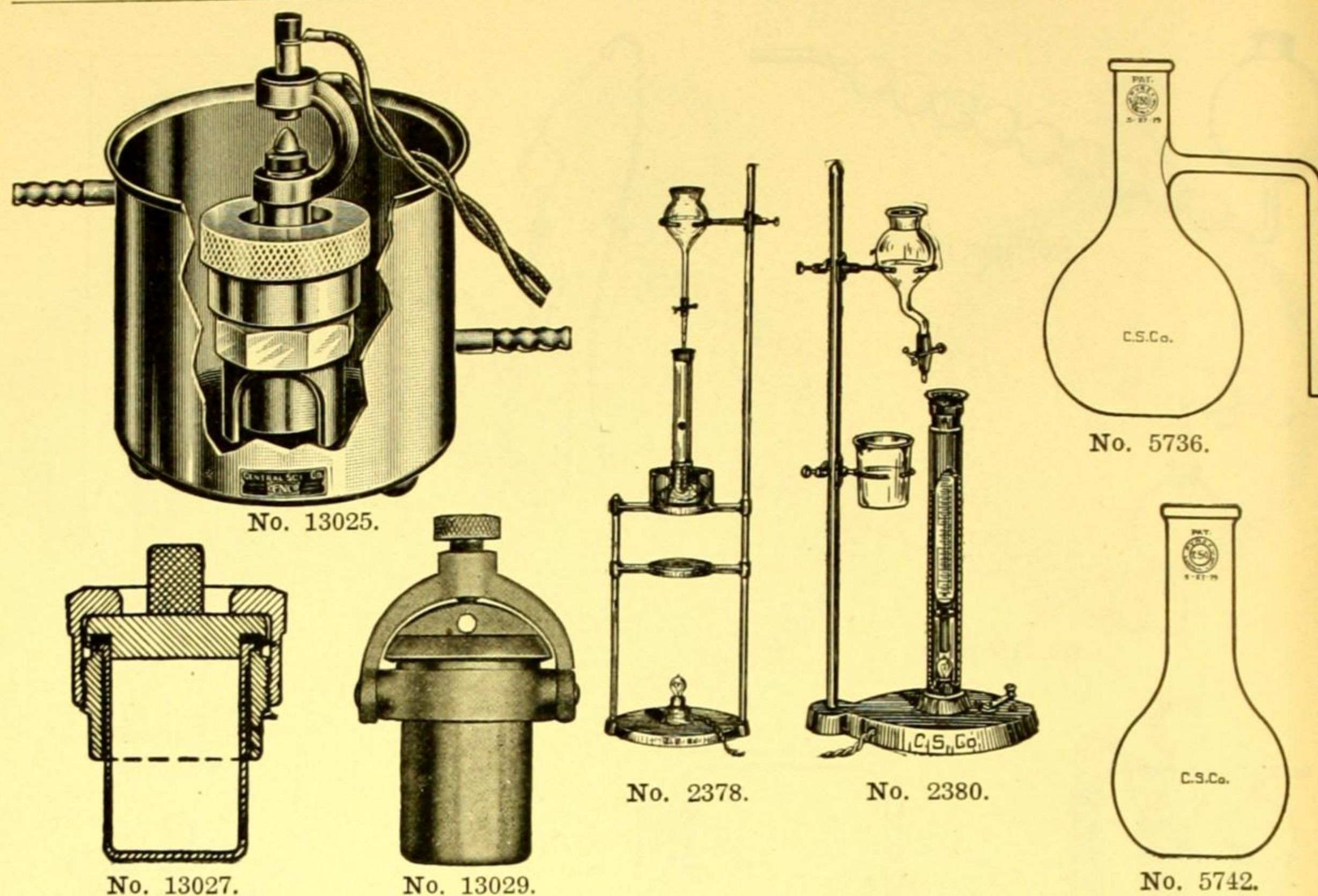
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No. 3394.

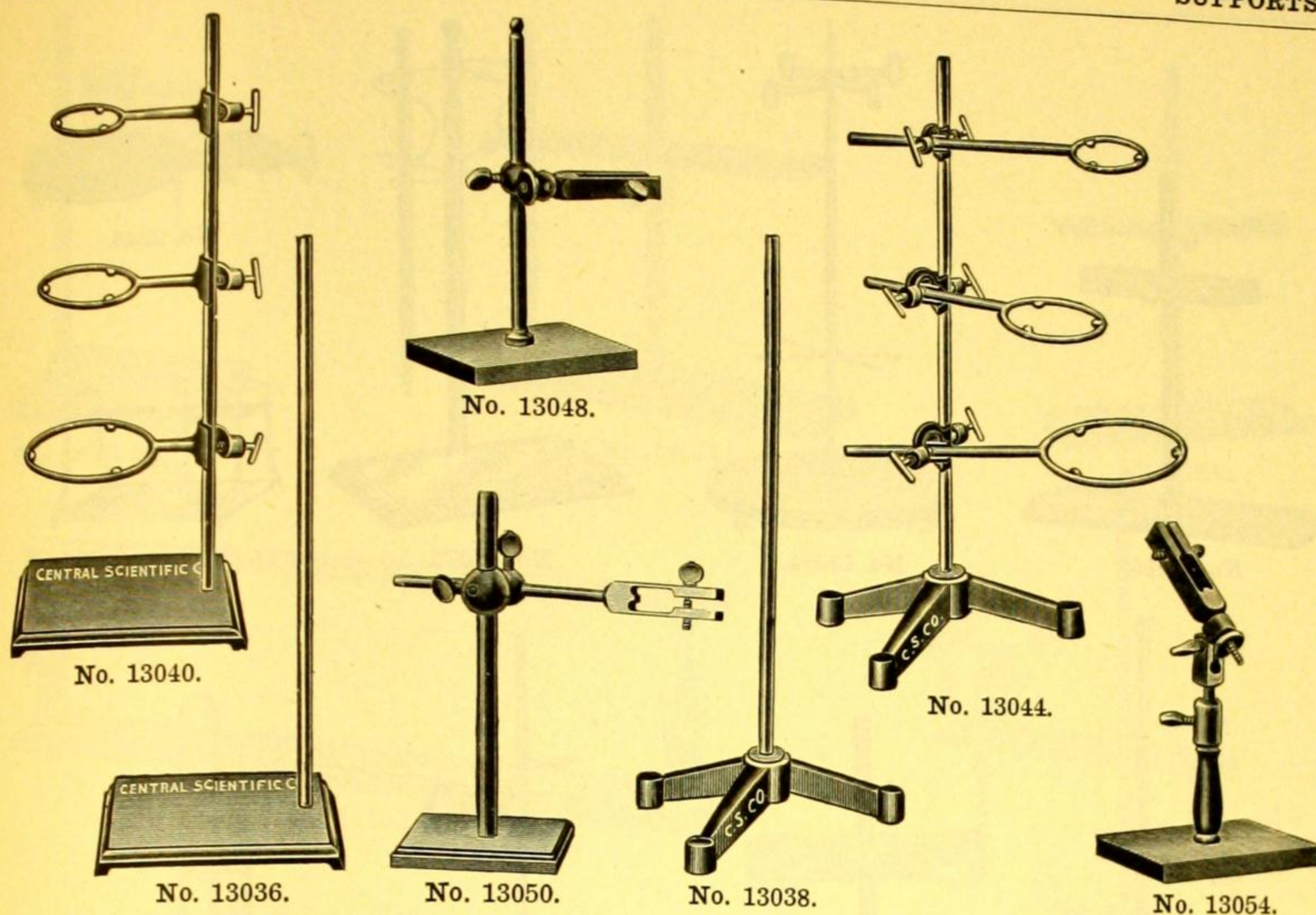
SULPHUR DETERMINATION APPARATUS

- 13014B. **SULPHUR APPARATUS**, Meyer, for the determination of sulphur in iron and steel by the bromine method. With 10 bulbs..... \$2.00
- 13016B. **SULPHUR APPARATUS**, Meyer, same as No. 13014B, but with stop-cock ground to fit bulb. With 10 bulbs 4.20
13020. **SULPHUR APPARATUS**, for the determination of sulphur in naphtha and illuminating oils, consisting of a glass absorber mounted on a wooden base, a chimney and a spray trap, all of chemically resistant glass. A small lamp, which is necessary, but not included with the apparatus, may conveniently consist of a 25 cc Erlenmeyer flask, a cork carrying a short section of glass tubing about $\frac{1}{8}$ inch inside diameter, and ordinary cotton wicking. (For method of determination see American Society for Testing Materials Tentative Specifications for 1921, No. D9-21T) 3.75
13024. **SULPHUR APPARATUS**, Norris, for the determination of sulphur in iron and steel. Complete as illustrated 3.00
10928. **Sulphur Bulb** only of No. 13024..... .70
5732. **SULPHUR APPARATUS**, for use in detecting sulphured or bleached grain. Consists of an Erlenmeyer flask with ground in stopper and delivery tube. Capacity, 500 cc. (See circular No. 111 of the Bureau of Plant Industry, United States Department of Agriculture.)..... 1.50
3394. **SULPHUR APPARATUS**, Pennock and Martin, of nickel, for the rapid and accurate determination of sulphur in coal and coke; consists of a pure nickel crucible of 40 cc capacity, with perforated lid for insertion of ignition wire, mounted upon an aluminum base. Diameter of crucible, $1\frac{1}{2}$ inches; height, $1\frac{3}{4}$ inches. (See Journal of the American Chemical Society, for December 1903, page 1265)..... 3.00
6698. **SULPHUR APPARATUS**, Referees', for the determination of sulphur in illuminating gas. Described in Technologic Paper No. 20 and Circular No. 48 of the United States Bureau of Standards 30.00



SULPHUR DETERMINATION APPARATUS, Continued.

13025. **SULPHUR BOMB**, Parr, Electric Ignition, with water bath, designed for the determination of organic and inorganic sulphur and organic halogens, replacing the Carius method. Recommended for the determination of sulphur in coal, coke, petroleum oils, rubber, organic or inorganic sulphur in foods, and for sulphur and carbon factor in organic or humic material in soils. The fusion cup is the same as used in the Parr Standard Calorimeter. The sample is mixed with sodium peroxide, placed in the bomb, which is then tightly sealed, and ignited by closing the switch. The sulphur is thereby converted into sulphate which is easily dissolved out and slightly acidified. The sulphur may be determined by either the gravimetric process or by means of the Parr Sulphur Photometers Nos. 2378-80. Complete with extra cup and cover, wrench and 12 extra gaskets. \$35.00
13026. **SULPHUR BOMB**, Electric Ignition, without water jacket, complete with extra cup, cover, wrench and 12 extra gaskets. 28.00
13027. **SULPHUR BOMB**, Parr, Heat Ignition, designed for the same purposes as No. 13026. The charge is ignited by heating the bottom of the cup with the flame of a burner. Complete with extra cup, cover, wrench and 12 extra gaskets. 22.00
- 13027A. **Cup**, only for Nos. 13025, 13026 and 13027. 5.75
- 13027B. **Cover**, only for Cup No. 13027A.90
13029. **SULPHUR BOMB**, Parr, simplified type for use where an inexpensive instrument is desired. Adapted for university class work and for commercial use where the bomb will be in constant hard service. 11.00
5736. **SULPHUR FLASK**, Pyrex Glass, flat bottom, with side neck bent at right angle, as used in determining sulphur in iron and steel. Capacity, 250 cc; neck takes a No 5 rubber stopper. Number in original case, 40.
Each75
Per original case. 27.00
5742. **SULPHUR FLASK**, Johnson's, Pyrex Glass, with heavy ring neck taking a No. 6 rubber stopper. Capacity to base of neck, 275 cc. Number in original case, 108.
Each32
Per original case. 31.10
2378. **SULPHUR PHOTOMETER**, Parr, for use in connection with the Parr Standard Calorimeter, for readily indicating the percentage of sulphur in coal, coke, and petroleum. The fused mass obtained from the calorimeter bomb is dissolved in water and the sulphur precipitated by means of barium chloride. From the depth of the liquid in the graduated tube at which the light from the flame disappears, a reading is obtained directly which indicates the percentage of sulphur in the sample. Sulphur determinations made with the Parr Sulphur Bomb and the Parr Sulphur Photometer require but 15 minutes where other methods require several hours. Results with this method are accurate within 2/10 of one per cent. 30.00
2379. **Barium Oxalate** for use with No. 2378. per 2 ounce bottle .75
2380. **SULPHUR PHOTOMETER**, Parr, similar in operation to No. 2378, but of simplified construction. 22.00



SUPPORTS, ALL KINDS

13036. SUPPORTS, Iron, rectangular base, with coppered steel rod.

No.	A	B	C	D
Size of base, inches.....	4x6 $\frac{3}{4}$	5x8	5 $\frac{1}{2}$ x9	6x11
Length of rod, inches.....	18	20	24	36
Diameter of rod, inches.....	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
Each	\$0.45	.60	.80	1.40

10% discount in lots of 10, 20% discount in lots of 100.

13038. SUPPORTS, Iron, tripod base, with coppered steel rod.

No.	A	B	C	D
Length of leg, inches.....	4 $\frac{1}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7 $\frac{1}{2}$
Length of rod, inches.....	18	20	24	36
Diameter of rod, inches.....	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$
Each	.50	.70	1.25	2.00

10% discount in lots of 10, 20% discount in lots of 100.

13040. SUPPORTS, Iron, rectangular base, consisting of Support No. 13036, with Rings No. 11502.

No.	A	B	C	D
Number of rings.....	2	3	4	4
Diameter of rings outside, inches.....	3,4	3,4,5	3,4,5,6	3,4,5,7
Each	.80	1.20	1.75	2.35

10% discount in lots of 10, 20% discount in lots of 100.

13042. SUPPORTS, Iron, tripod base, consisting of Support No. 13038 with Rings No. 11502.

No.	A	B	C	D
Number of rings.....	2	3	4	4
Diameter of rings outside, inches.....	3,4	3,4,5	3,4,5,6	3,4,5,7
Each	.85	1.30	2.15	3.00

10% discount in lots of 10, 20% discount in lots of 100.

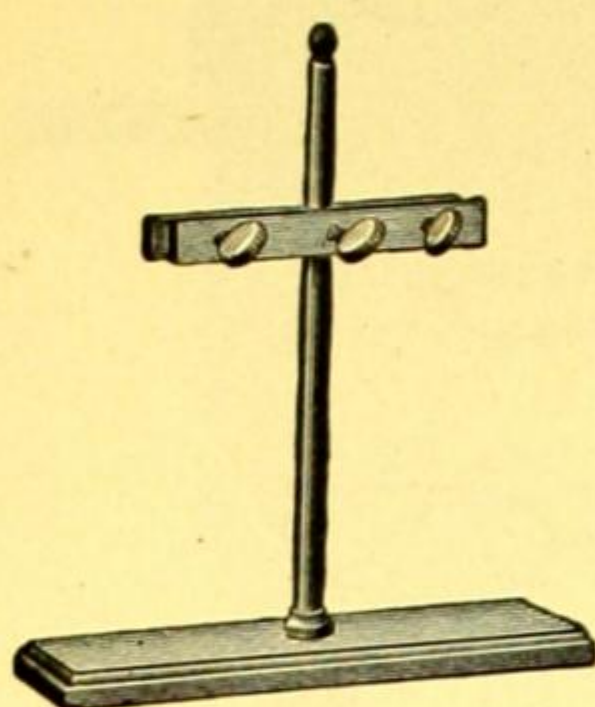
13044. SUPPORT, Iron, tripod base, consisting of No. 13038B, with one each Extension Rings No. 11504, 3, 4 and 5 inches, and 3 No. 2914 Clamp Holders. Complete as illustrated..... 2.25

13048. SUPPORT, Hardwood, Gay-Lussac's, with clamp cork lined, adjustable in three directions. Length of upright rod, 16 inches..... 1.70

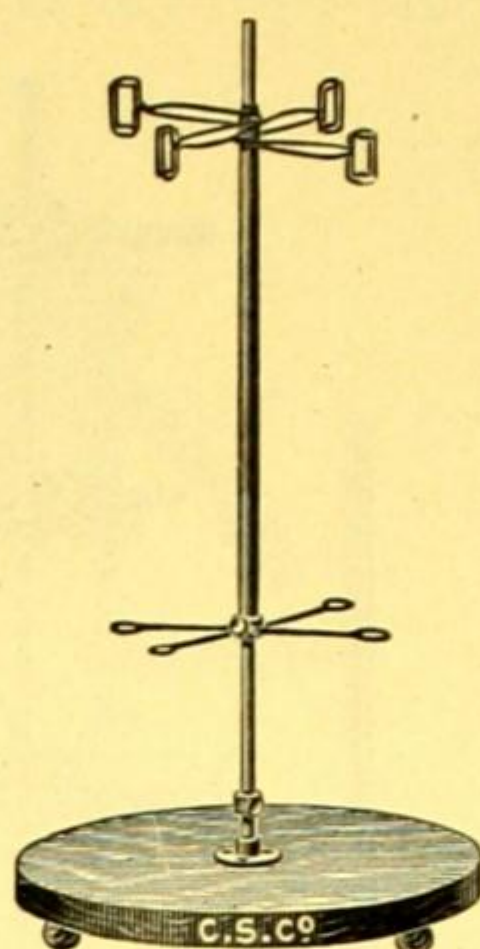
13050. SUPPORT, Hardwood. Improved form of Gay-Lussac's, with clamp on a $\frac{1}{2}$ -inch extension rod, 10 inches long..... 1.80

13051. Wooden Clamp only of No. 13050, for use with clamp holders, etc., in connection with iron supports..... 1.25

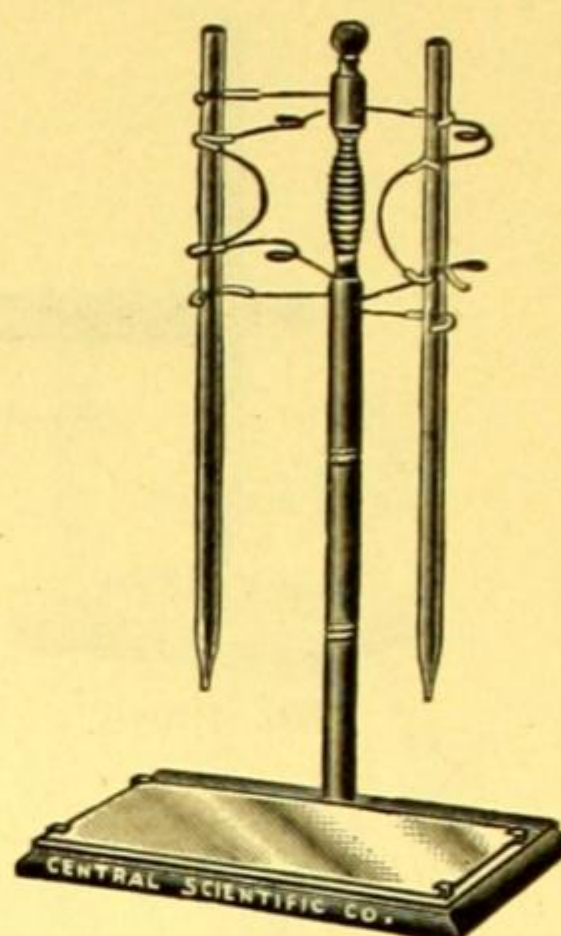
13054. SUPPORT, Hardwood, Schellbach's. Clamp cork lined, universal movement..... 2.25



No. 13060.



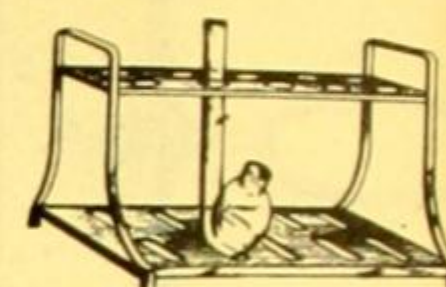
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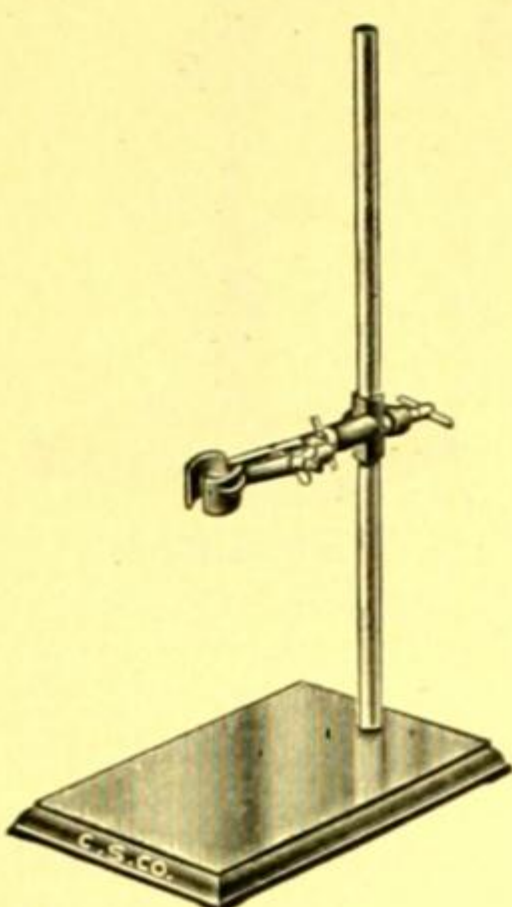
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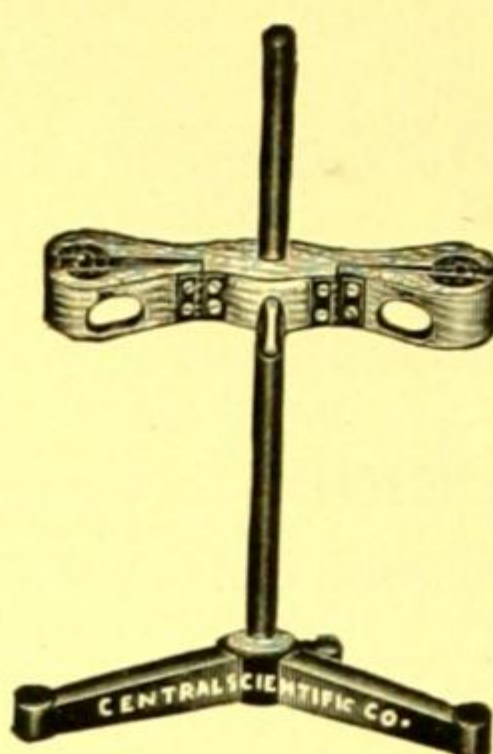
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No. 5292.



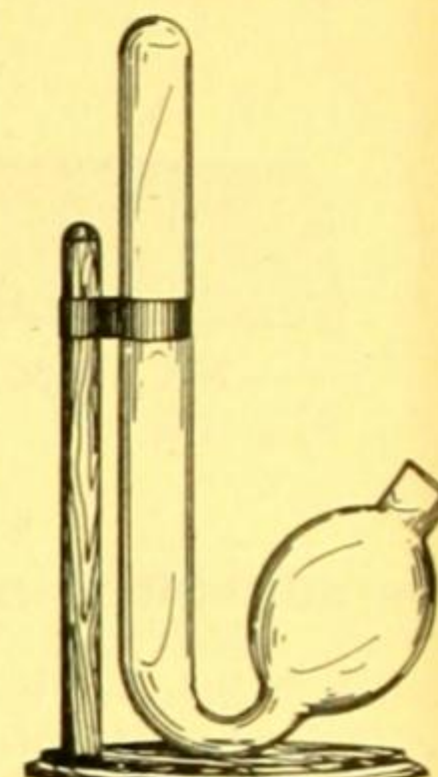
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No. 13078.

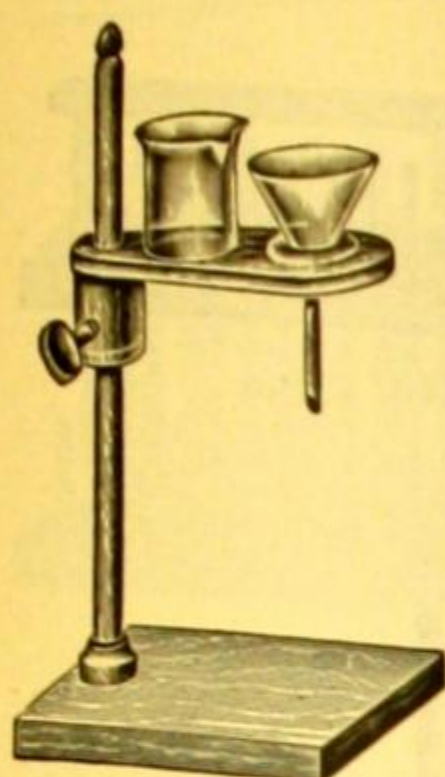


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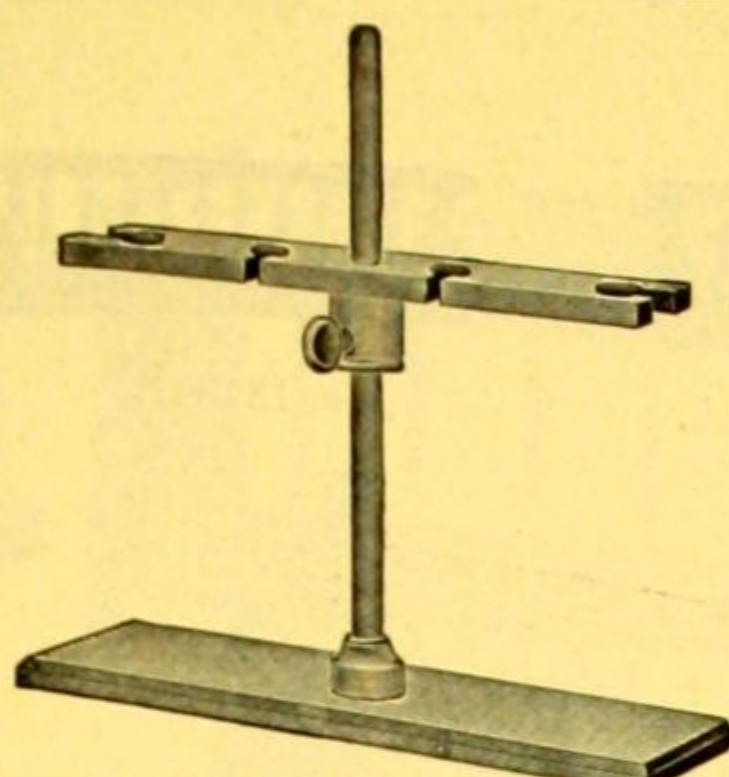


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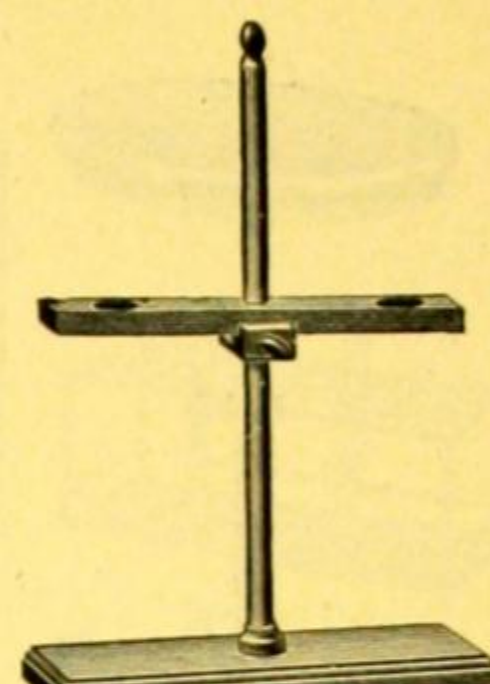
13060. **SUPPORT, Burette, Hardwood**, with cork-lined clamp, for two burettes..... \$1.80
13064. **SUPPORT, Burette, Hardwood**, round base, with nickel-plated steel rod, 22x5/16 inches, and revolving spring clamps for four burettes. Adjustable in height..... 4.00
13073. **SUPPORT, Burette, Hardwood, Chaddock**. The rod and base are of polished hardwood. On top of the base is a rectangular piece of opal glass. The clamp is of rubber-covered, heavy spring wire, which holds the burette firmly in place without danger of breakage. The burette is readily placed in position or removed by simply pushing back the wire spring. For two burettes..... 3.00
13076. **SUPPORT, Burette, Iron**, consisting of Support No. 13036B, with Clamp No. 2842..... 1.15
13078. **SUPPORT, Burette, Iron**, consisting of Support No. 13038B, with cork-lined hardwood clamp for two burettes..... 3.00
2248. **SUPPORTS, Burner, Iron**, with flat top and heavy screw for attachment to support stand. Useful for supporting burners and many other laboratory devices.
- | | | |
|-----------------------|-------|-----|
| No. | A | B |
| Diameter, inches..... | 3 1/2 | 5 |
| Each | .35 | .50 |
10286. **SUPPORT, Conductivity**, for use in thermostats for holding flasks, calomel electrodes, etc. Heavy base of white metal with rod and Cenco friction clamp of brass, nickel-plated.. 3.00
For **SUPPORTS, Conductivity Cell**, see under general heading **Physical Chemistry Apparatus**.
- SUPPORTS, Electrolytic**, see **Electrolytic Apparatus**.
5290. **SUPPORT, Fermentation Tube**, for single tubes. Of wood with brass clip for holding tubes..... 1.00
5292. **SUPPORT, Fermentation Tube**, of metal, for holding 10 fermentation tubes. Can also be used for test tubes, ureometers, and any tubes not less than 5 inches long..... 3.00



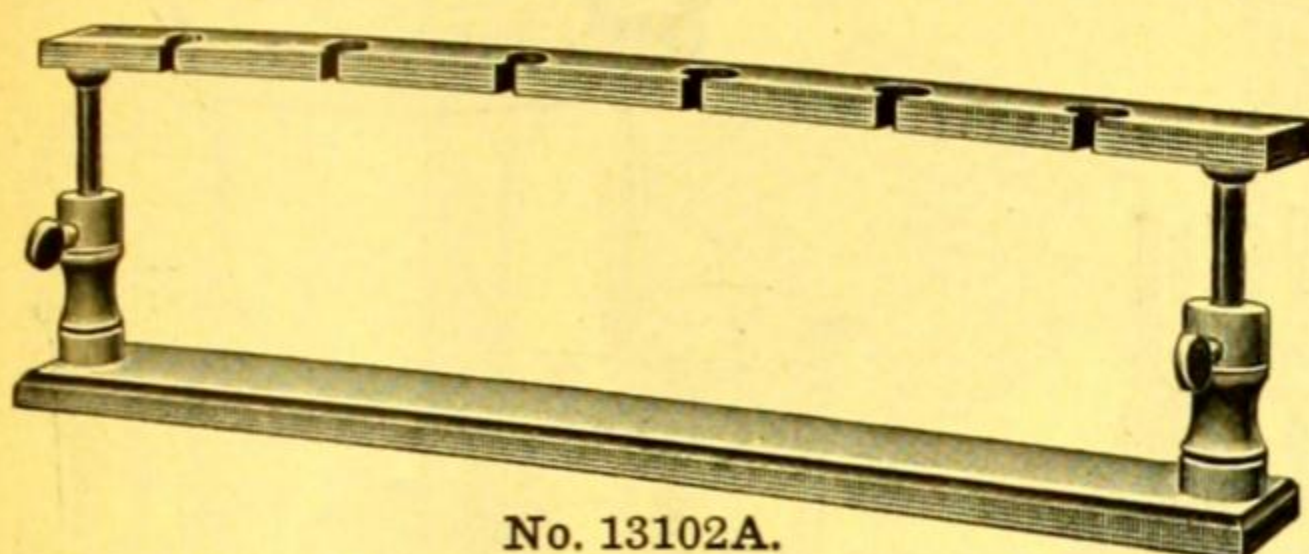
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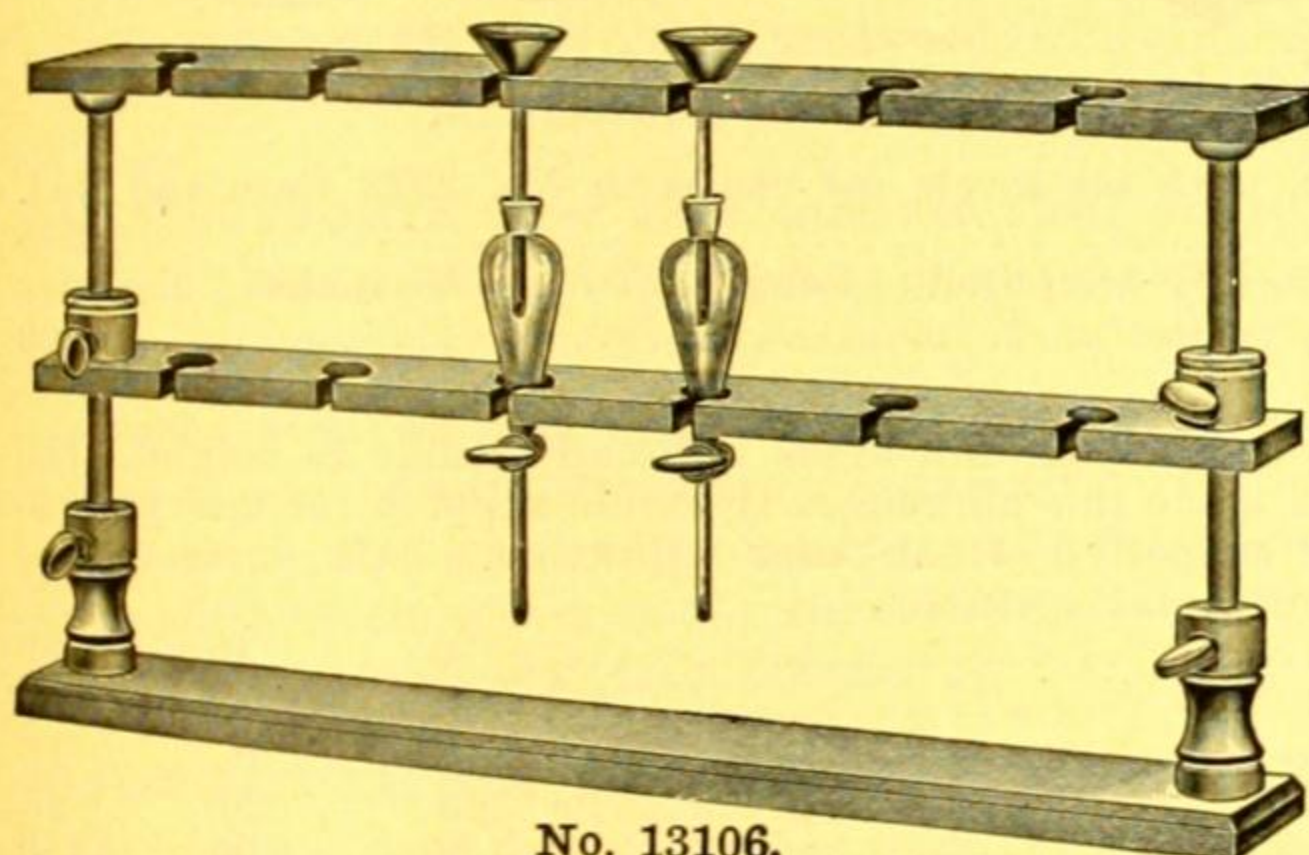
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No. 13096.



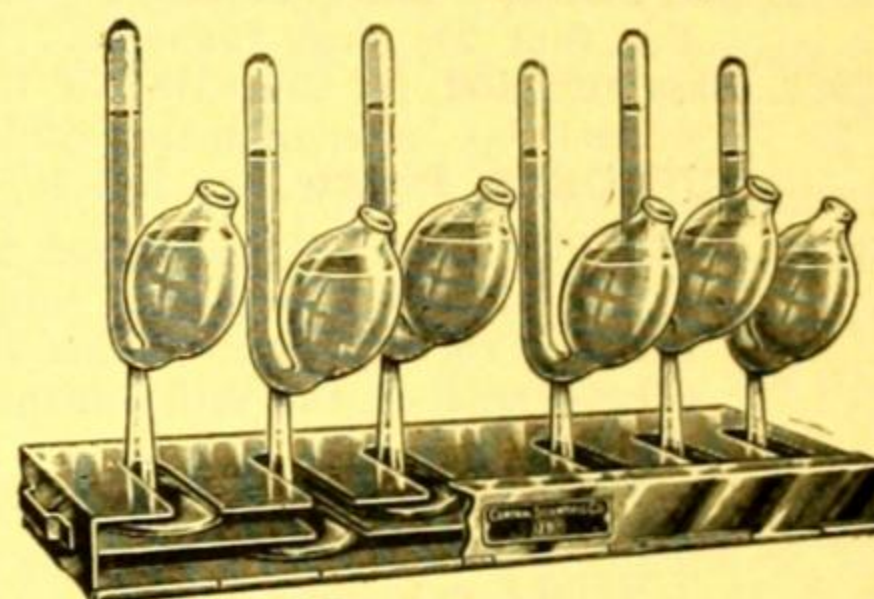
No. 13102A.



No. 13106.

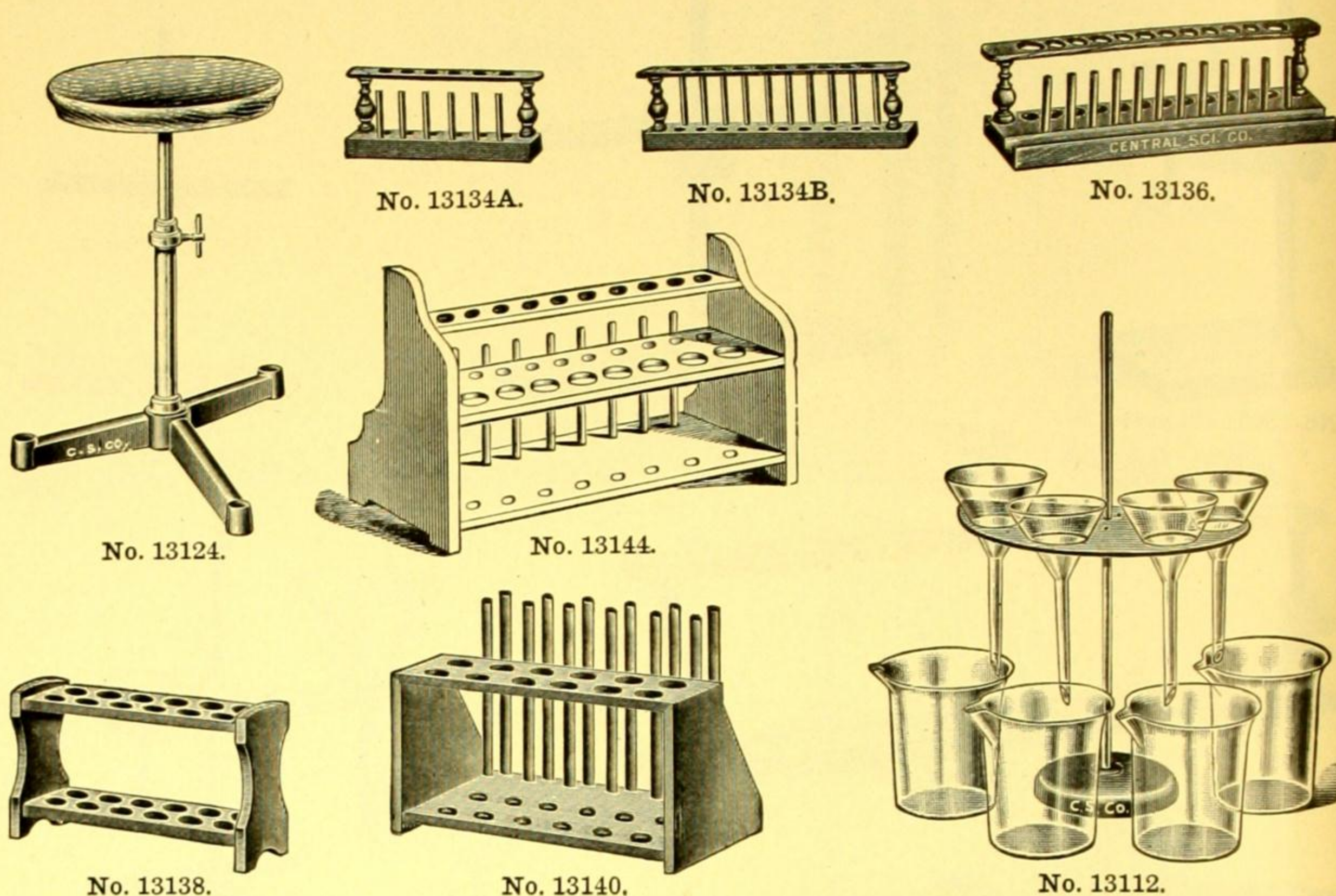


No. 13100 (mounted).

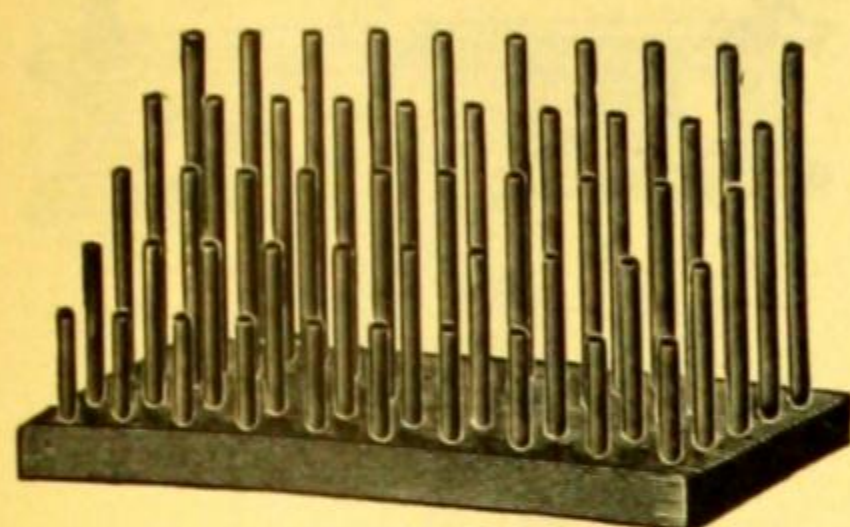


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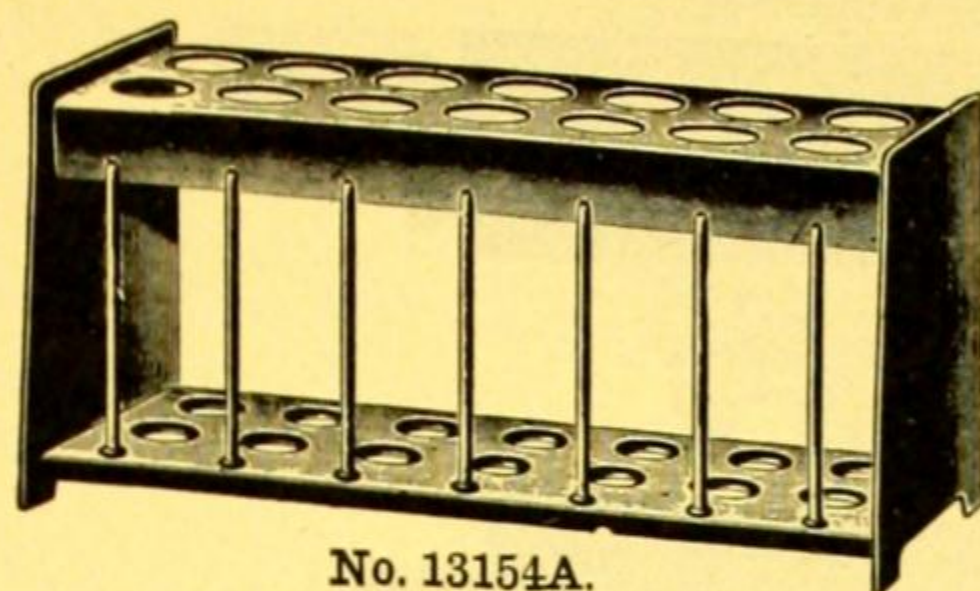
5294. **SUPPORT, Fermentation Tube, Stull**, designed to overcome the difficulty and breakage in handling the fragile glass-footed fermentation tubes in washing, sterilizing, filling and incubating. The support is arranged so that the feet of the two rows of tubes overlap, thus enabling more tubes to be placed in the same area on the incubator shelf. Made of heavy sheet copper with shelves and slots arranged to accommodate six tubes. With cover in place, tubes can be handled freely without danger of breakage. Provided with handles to facilitate removal from the sterilizer when hot. Dimensions, $11\frac{1}{2} \times 3 \times 1$ in. Without glassware. \$5.00
13094. **SUPPORT, Funnel, hardwood**, for one funnel, with arm large enough to accommodate beakers. Height of rod, 16 inches. 1.00
10% discount in lots of 10. .90
13096. **SUPPORT, Funnel, hardwood**, for two funnels. 10% discount in lots of 10. .90
13098. **SUPPORT, Funnel, hardwood**, similar to No. 13096, but for four funnels, and with holes slotted enabling funnels to be removed from the side. 1.20
10% discount in lots of 10. .75
13100. **SUPPORT, Funnel, hardwood**, with iron clamp for attachment to support stand. With slotted holes for four funnels. Without support stand. .75
10% discount in lots of 10. .75
- 13102A. **SUPPORTS, Funnel, hardwood, improved form**, with slotted holes. Adjustable in height from $7\frac{1}{2}$ to 12 inches. For 6 funnels. 4.00
10% discount in lots of 10. .75
13106. **SUPPORT, Funnel, hardwood, Leach**, for separatory funnels. Both bars adjustable in height. 5.50
For six funnels. 10% discount in lots of 10. .75



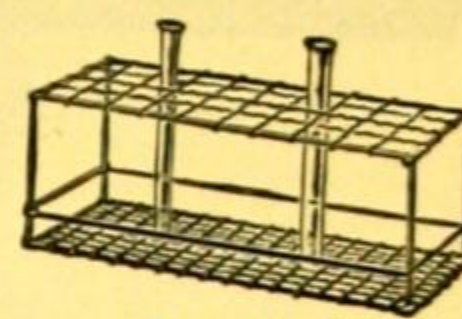
13112. **SUPPORT, Funnel, Stoddard's Aluminum**, with set screw for use with No. 2922 Base and Rod. For four $2\frac{1}{2}$ inch funnels. \$2.75
2922. **Base and Rod**, for use with No. 13112. Heavily weighted. Length of rod, 15 inches; diameter of rod, $\frac{7}{32}$ inch; diameter of base, $3\frac{1}{2}$ inches60
- SUPPORTS, Pipette**, see No. 10560.
13124. **SUPPORT TABLES**, hardwood top with iron tripod, and brass tube, adjustable in height. The heaviness of the base and support rods make this an unusually stable support for heavy apparatus or for apparatus which should be supported free from vibration. All surfaces are turned true on the lathe, insuring a horizontal surface.
- | No. | A | B | C |
|----------------------------------|------|------|-------|
| Diameter of top, inches. | 6 | 8 | 12 |
| Height closed, inches. | 12 | 16 | 17 |
| Height extended, inches. | 18 | 26 | 27 |
| Each | 7.50 | 9.00 | 13.50 |
13126. **SUPPORT TABLES**, same as No. 13124, but with top of iron machined to a true plane. Dimensions same as No. 13124. No. A B C
- | No. | A | B | C |
|----------------|------|-------|-------|
| Each | 8.00 | 10.00 | 19.00 |
- 13134A. **SUPPORTS, Test Tube**, hardwood, with heavy base and drying pins. For 6 tubes.35
10% discount in lots of 10, 20% discount in lots of 100.
13136. **SUPPORT, Test Tube**, hardwood, Griffith's, similar to No. 13134, but with trough in base for draining, or for holding stirring rod, pipettes, etc. With 10 holes for $\frac{3}{4}$ inch tubes, 2 for 1 inch tubes and 12 drying pins.65
10% discount in lots of 10, 20% discount in lots of 100.
13138. **SUPPORTS, Test Tube**, hardwood, for twelve tubes in two rows.
- | No. | A | B |
|------------------------------------|---------------|----------------|
| Diameter of holes, inches. | $\frac{7}{8}$ | $1\frac{1}{8}$ |
| Each | .75 | .85 |
- 10% discount in lots of 10, 20% discount in lots of 100.
13140. **SUPPORT, Test Tube**, hardwood, for 12 tubes in two rows with 12 drying pins. Diameter of holes, $1\frac{1}{8}$ inches.1.10
10% discount in lots of 10, 20% discount in lots of 100.
13144. **SUPPORTS, Test Tube**, hardwood, with two shelves, and drying pins.
- | No. | A | B |
|-------------------------|-----|------|
| For test tubes. | 13 | 25 |
| Each | .55 | 1.00 |
- 10% discount in lots of 10, 20% discount in lots of 100.



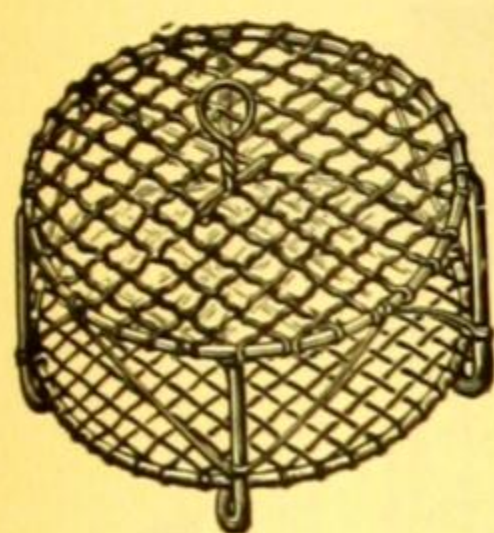
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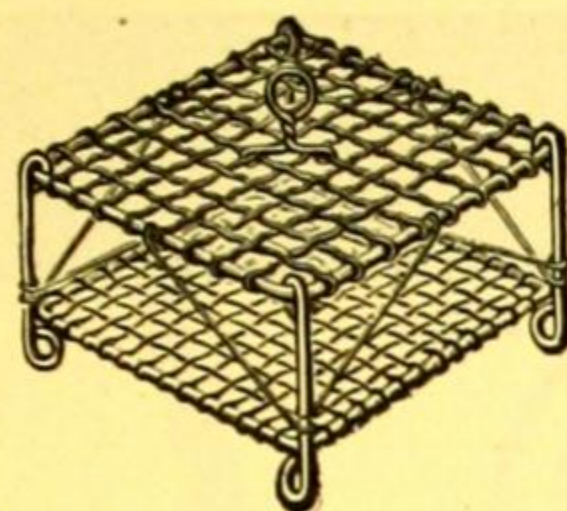
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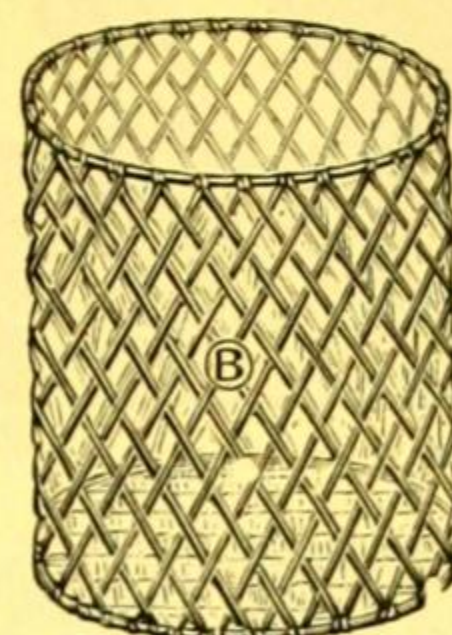
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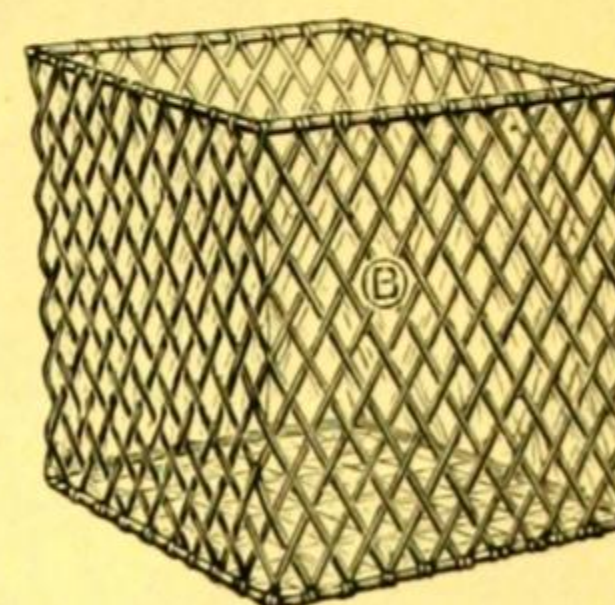
No. 13160.



No. 13162.



No. 13164.



No. 13166.

13150B. **SUPPORTS, Test Tube, hardwood, with pins only, for drying test tubes, bottles, flasks, etc.**
For 50 test tubes..... \$2.00

13154A. **SUPPORTS, Test Tube, stamped steel, finished with hard baked black enamel, with holes for**
7 test tubes up to $\frac{3}{4}$ inch in diameter and 7 test tubes up to 1 inch in diameter. A row of
7 drying pins is also provided. Total capacity 14 tubes..... .65

Cenco wire test tube supports and wire test tube baskets are of superior quality, being galvanized, instead of covered with tin as are other makes. The combination of the zinc of the galvanizing and the iron of the basket wire **resists rusting**, while the tin on the cheaper baskets **accelerates rusting** when the smallest break occurs in the tin coating, due to the electrolytic action of the iron and tin, the iron readily forming hydrated iron compounds.

13158. **SUPPORT, Test Tube, galvanized iron wire.** Will hold 40 tubes. Size, $9\frac{1}{2}$ inches long by $4\frac{1}{2}$ inches wide by $3\frac{1}{2}$ inches high..... .75
10% discount in lots of 10, 20% discount in lots of 100.

13160. **SUPPORT, Test Tube, galvanized iron wire, round form, for forty-four $\frac{7}{8}$ -inch test tubes.** Diameter, $7\frac{1}{2}$ inches; height, $3\frac{1}{2}$ inches..... 1.30

13162. **SUPPORT, Test Tube, galvanized iron wire, square form, for forty-eight $\frac{7}{8}$ -inch test tubes.** Dimensions, $7\frac{1}{2}$ inches by $7\frac{1}{2}$ inches by $3\frac{1}{2}$ inches high 1.15

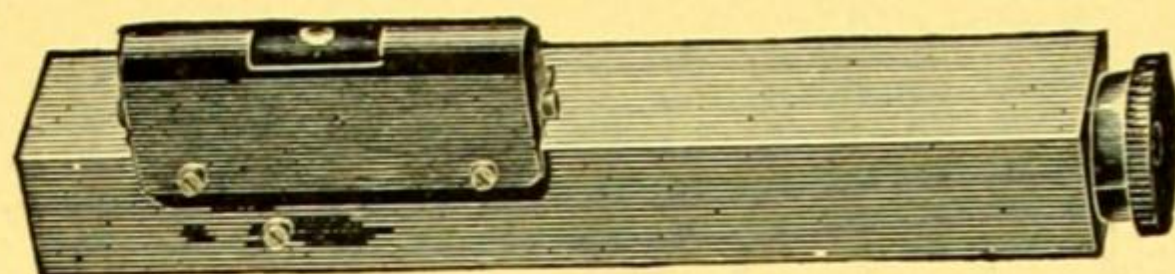
13164. **SUPPORT, Test Tube Basket, galvanized iron wire, cylindrical form, for sterilizing and incubating culture tubes.** Diameter, 6 inches; height, 6 inches..... .95

13166. **SUPPORTS, Test Tube Basket, galvanized iron wire, rectangular form.**

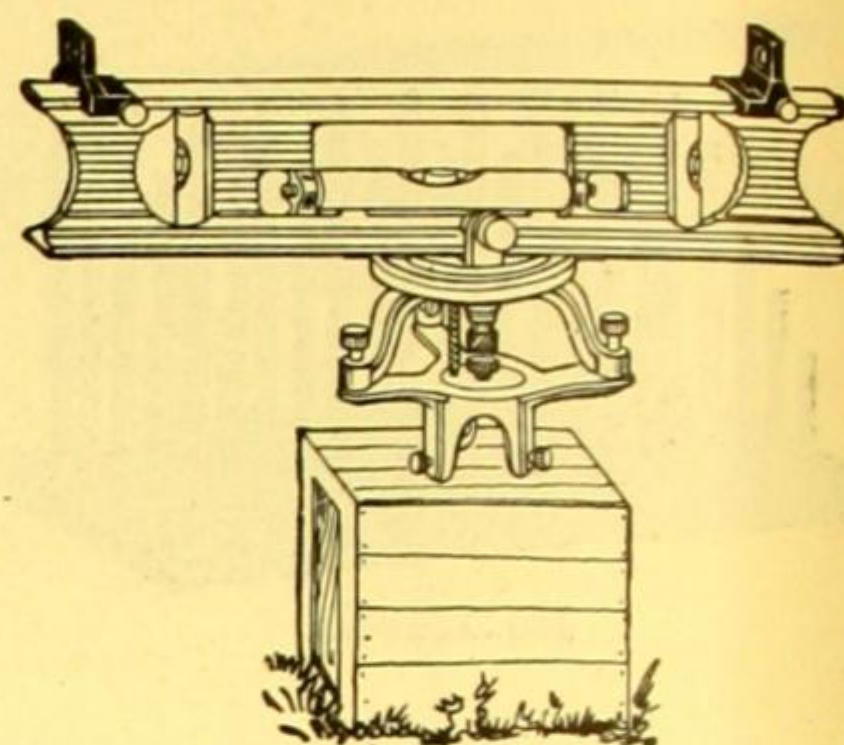
No.	A	B
.....	6	$5\frac{1}{2}$
Height, inches	6	4
Width, inches	6	5
Length, inches	1.15	.95
Each		

10% discount in lots of 10, 20% discount in lots of 100.

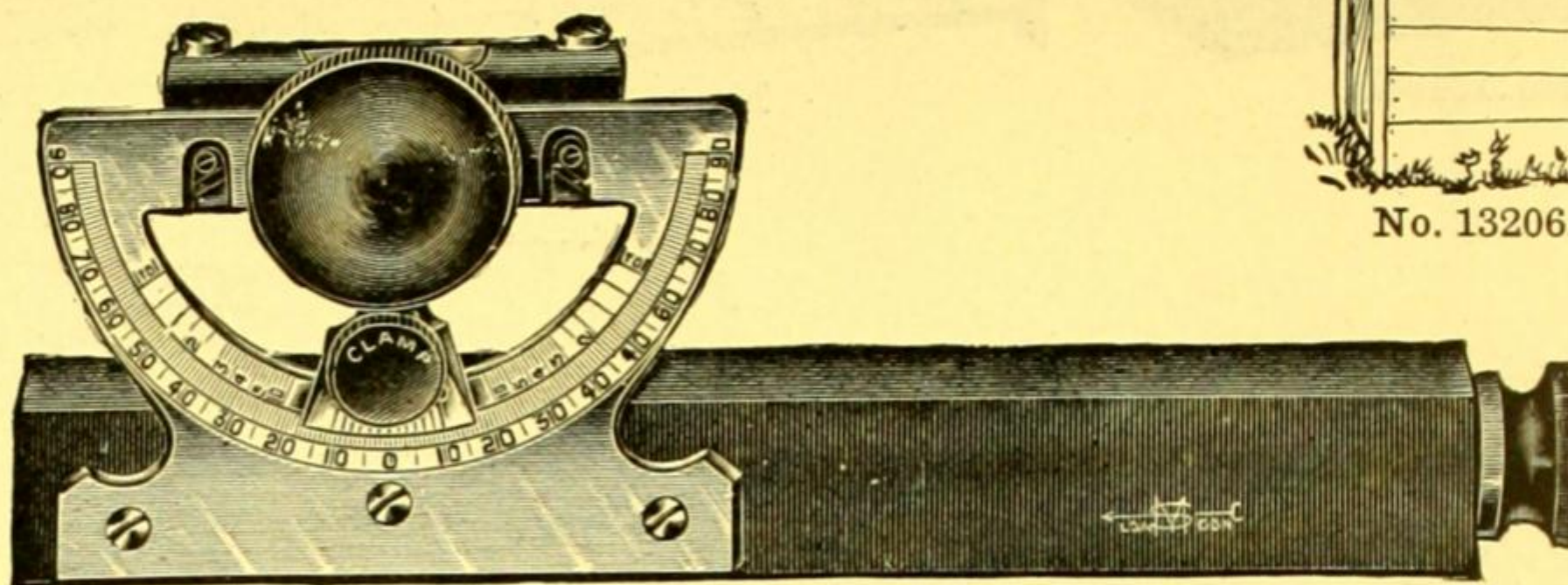
SUPPORT, Weighing Tube, see Balance Accessories.



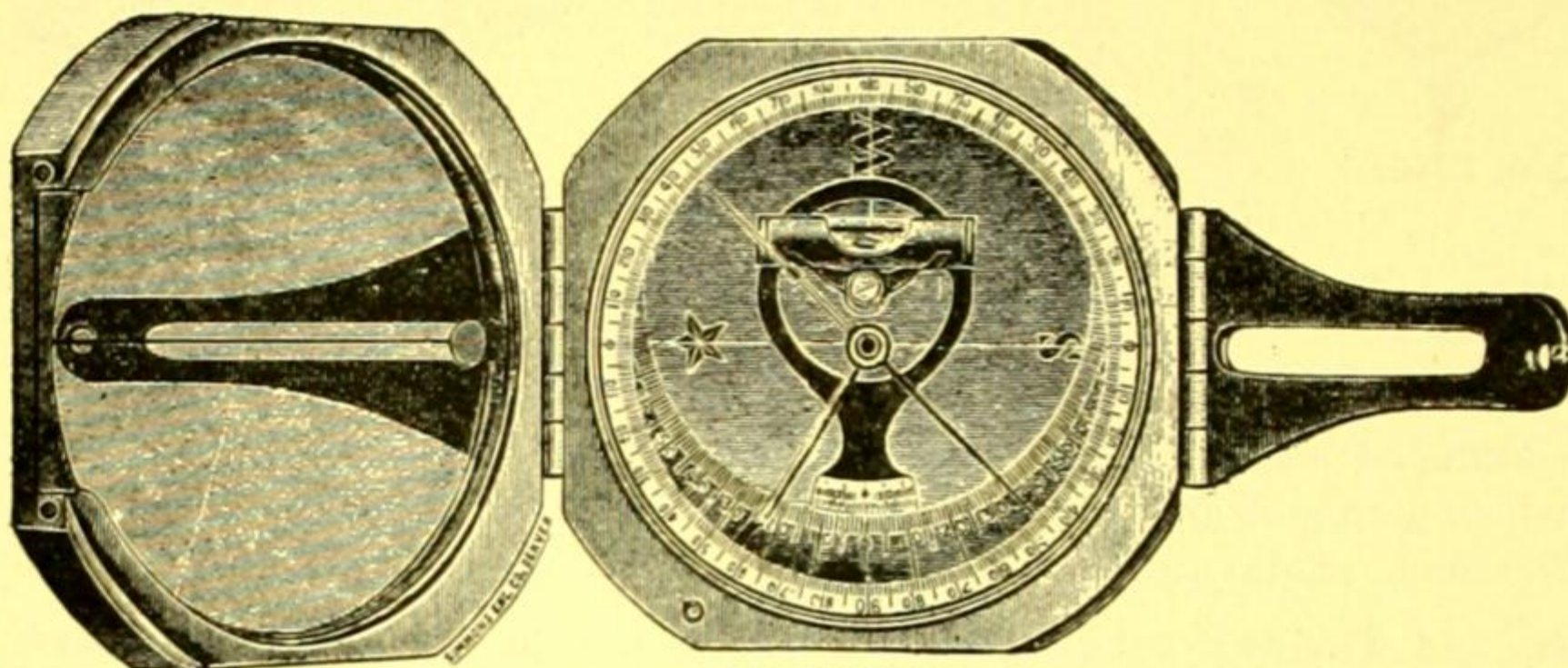
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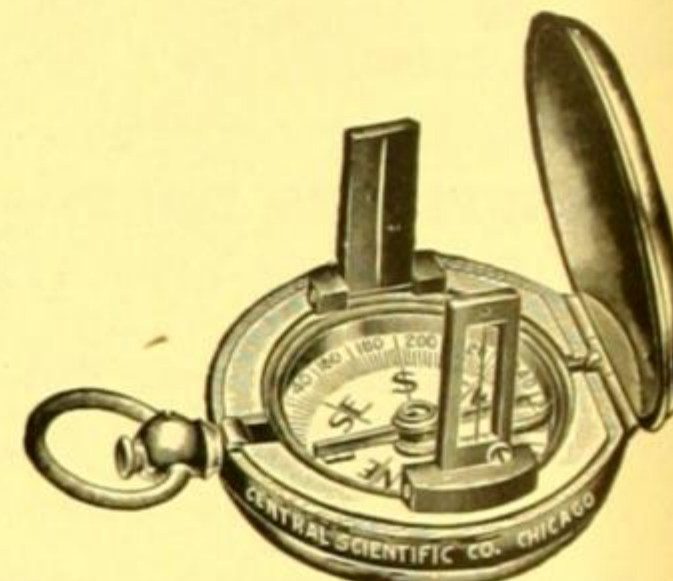
No. 13206.



No. 13182.



No. 13190.



No. F2625.

SURVEYING INSTRUMENTS, SIMPLE TYPE

For Forestry, Mining and Geological Work.

BAROMETERS, see general heading **Barometers**.

13182. **CLINOMETER**, Abney's Reflecting Level or Pocket Altimeter, for measuring the height of buildings, trees, hills, etc., and also for fixing the slopes for railroads, the rise and fall of ground for drainage purposes, and all operations where angular distance or inclination of surface is desired. Sighting tube 5 inches long, large German silver arc, extra long draw eye-piece, improved fixing clamp to vernier. The arc has two graduated scales upon it, one giving the angular measurements by degrees, and subdivided to 5 minutes by the vernier divisions on the index. The other scale is figured 1 to 10 with their subdivisions. Complete in leather case, with directions..... \$19.00
- F2625. **COMPASS**, Sight, watch case form, 50 mm diameter, with raised dial and full circle divisions. Bar needle, 30 mm long, with agate cap. Sights and spring cover..... 6.75
13190. **COMPASS**, Surveying, Brunton Patented Pocket Transit, for surface and underground surveying in mining and geological work. Case is of aluminum $2\frac{3}{4} \times 2\frac{3}{4} \times 1$ inch. Weight, 8 ounces 30.00
13202. **LEVEL**, Hand, Reflecting, for measuring slopes and gentle elevations. Consists of a square bronzed tube with level, cross-hair, and fixed eye-piece; length, 5 inches; weight, $2\frac{1}{2}$ ounces 7.50
13206. **LEVEL**, Simple Form, consisting of a metal level, a pair of level sights and a stand for supporting the level upon a flat surface or on the end of a stake or crow bar. By its use one can readily determine levels from a given point to one at a distance, such as locating or setting the profiles for foundation work, ascertaining the proper grades for drains, ditches, etc. All parts of the stand are of metal, nickel-plated. The level is of metal, nickel-plated and japanned, and provided with a $3\frac{1}{2}$ inch horizontal spirit level and two $1\frac{1}{2}$ inch vertical spirit levels. The sights are adjustable and clamp to the top of the level by set screws. One sight is provided with a peep hole and the other with a horizontal cross wire. Complete as described, without stake or support..... 9.00

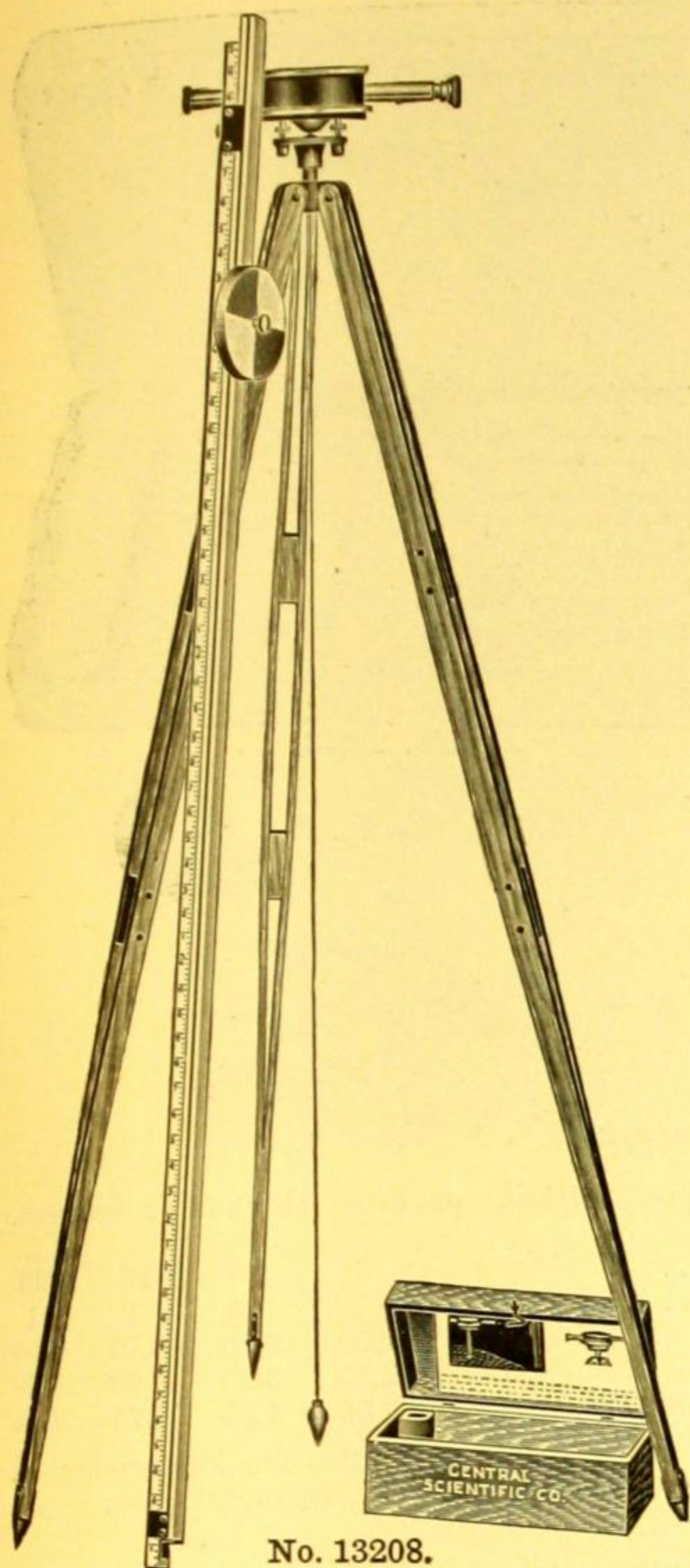


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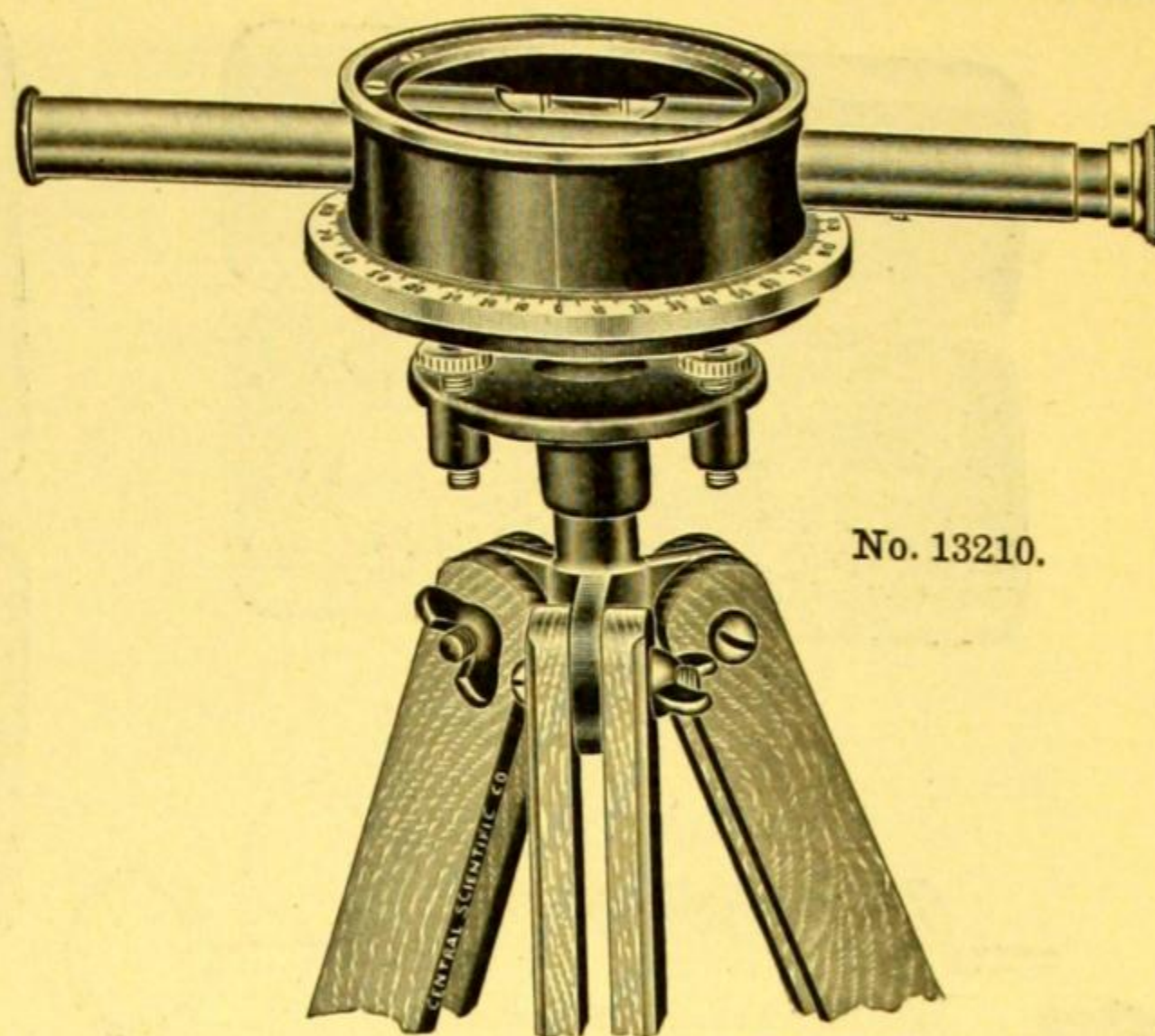


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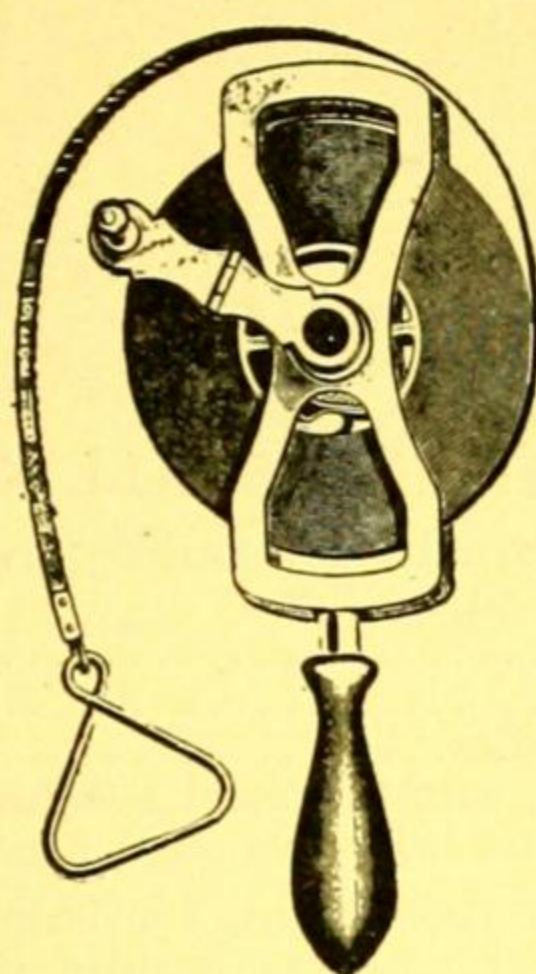
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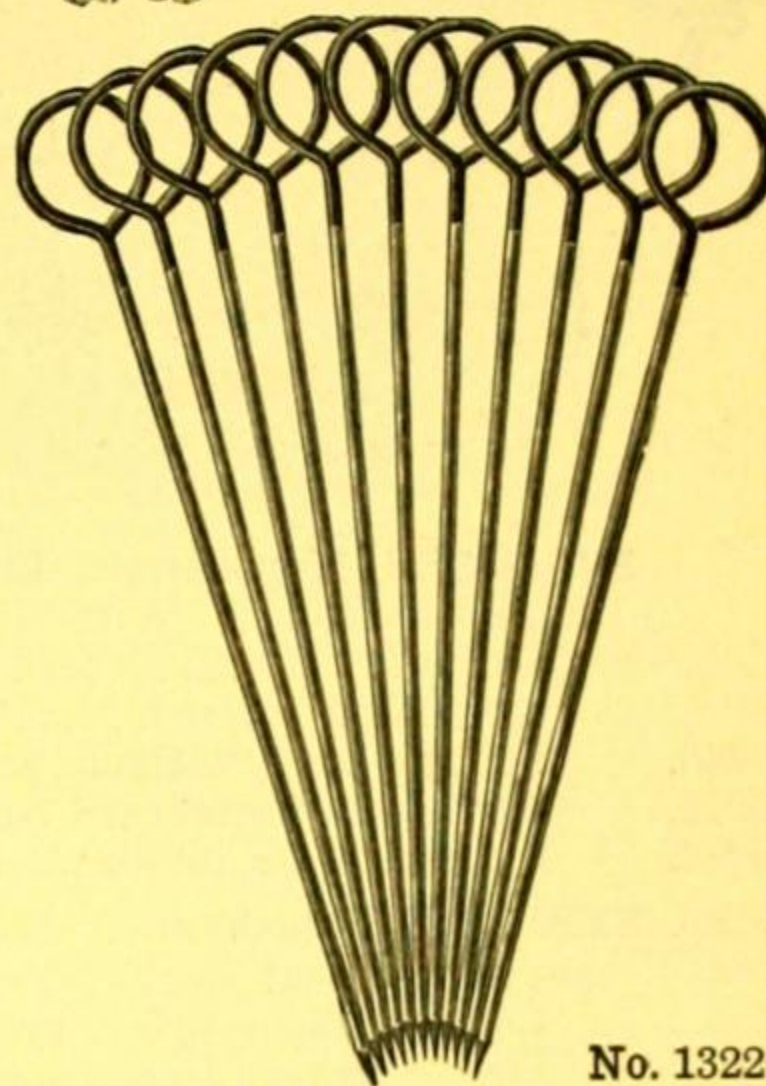
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No. 13210.



No. 13226.



No. 13220

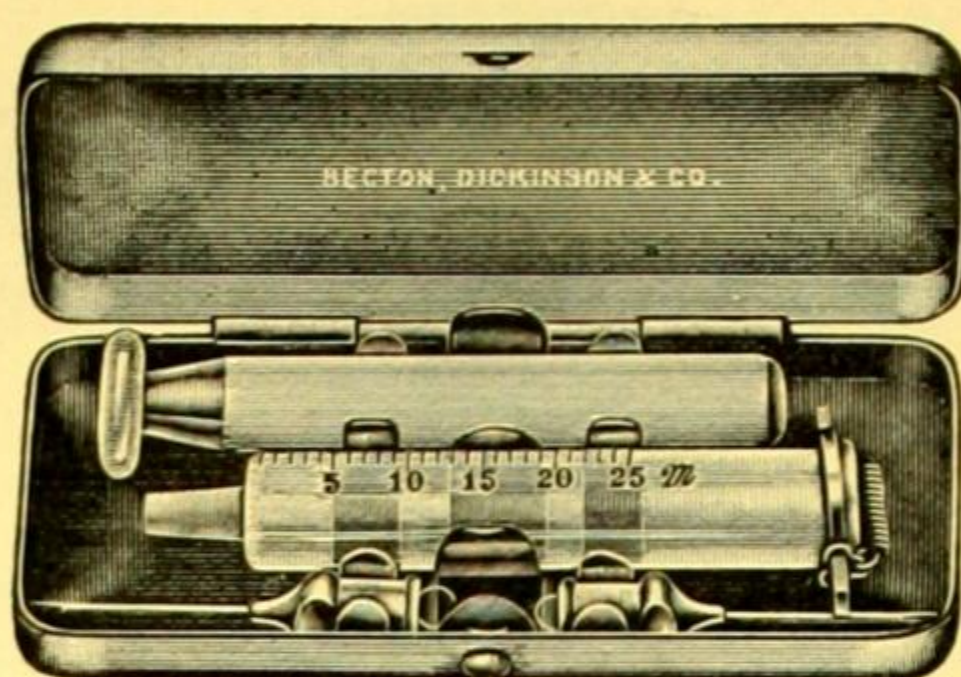
13208. **LEVEL, Bostrom's Improved**, provided with telescope which has a magnifying power of eight diameters which enables the cross on the target to be read at a distance of one-quarter of a mile in any direction. A circle graduated in degrees is provided for obtaining angles, squaring up buildings, and all such work. Included in the outfit is a sliding target rod, graduated in feet, inches, and quarter inches, telescoping to five feet when closed and to nine and one-half feet when extended, and having a sliding target of the usual form with thumb-screw for securing in any position. The metal parts are of iron and brass, and the wood parts, including the target, are of pine. Complete in neat wood box with tripod, sliding target rod, target and plumb bob..... \$22.50

13210. **LEVEL, Bostrom's Improved**, similar to No. 13208, but more substantial and of finer finish. The telescope has a magnifying power of twelve diameters so that the instrument has a much greater range. All wood parts are of hardwood and all metal parts of brass except the target. Complete in neat wood box with tripod, sliding target rod, target and plumb bob..... 32.50

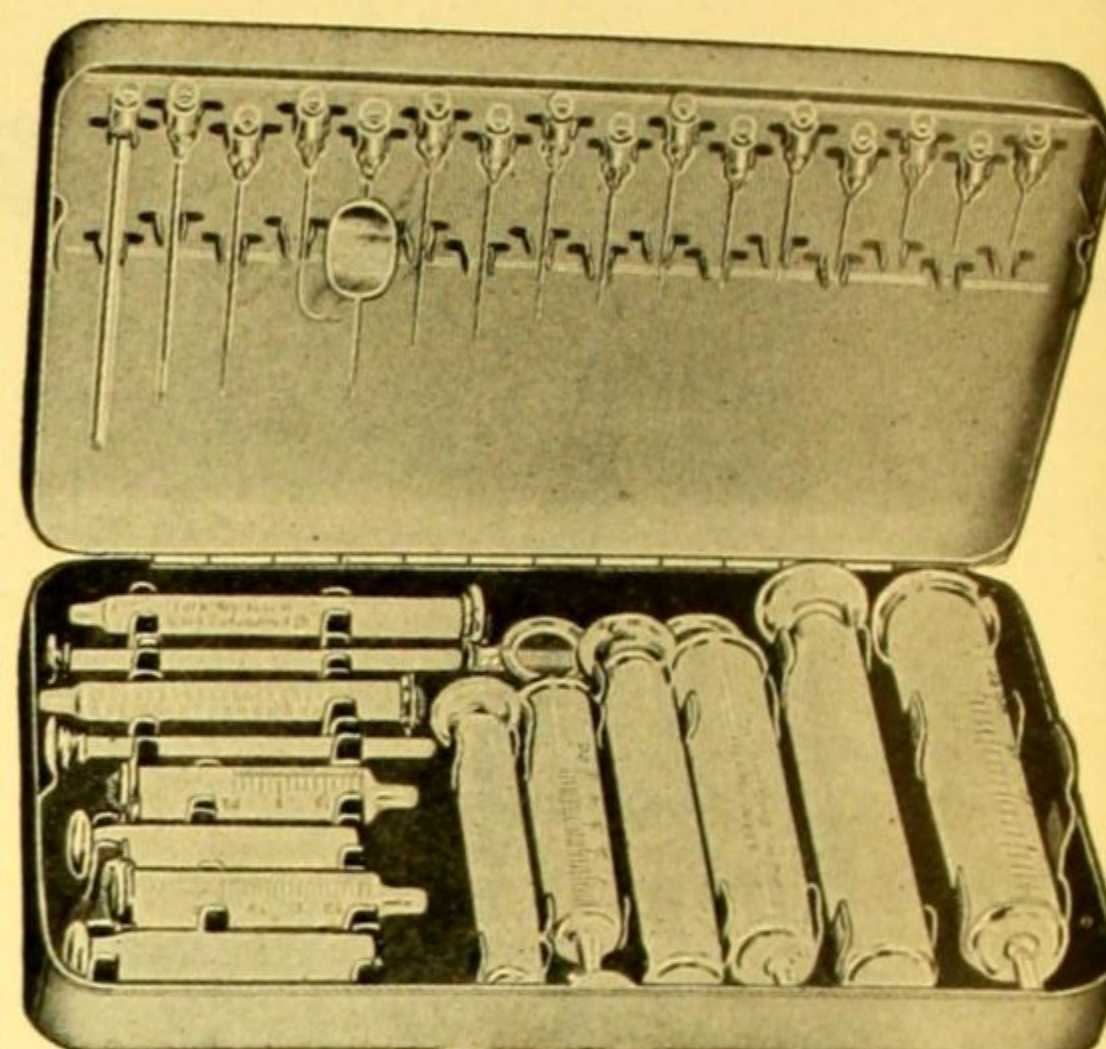
13220. **SURVEYORS' ARROWS**, made of $\frac{3}{64}$ inch round steel 14 inches long, and with rings enamelled in bright vermilion.....per set of eleven 1.75

13226. **TAPES, Surveyors' Chain**, graduated on Babbitt Metal. This tape will answer the requirements of the most severe usage and take the place of the old-time steel chain. It is made of practically unbreakable steel, heavily coated with white metal to prevent rusting and corrosion, and somewhat heavier than the ordinary chain tape. The graduations are stamped into Babbitt Metal at each foot (end feet in tenths), or at each link (end links in tenths), so that the graduations can readily be felt as the tape is allowed to pass through the hand. Each tape is provided with a pair of detachable handles, and the reel, which is built especially for such tapes, has a nickel-plated frame with folding winding handles, is easily wound and of beautiful finish.

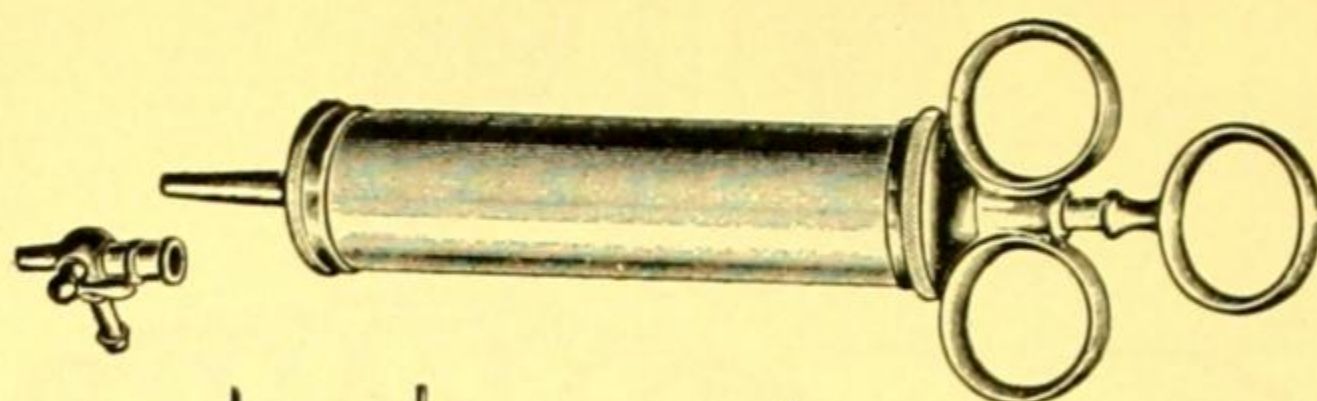
Length	100 feet	100 links
Each	10.00	8.75



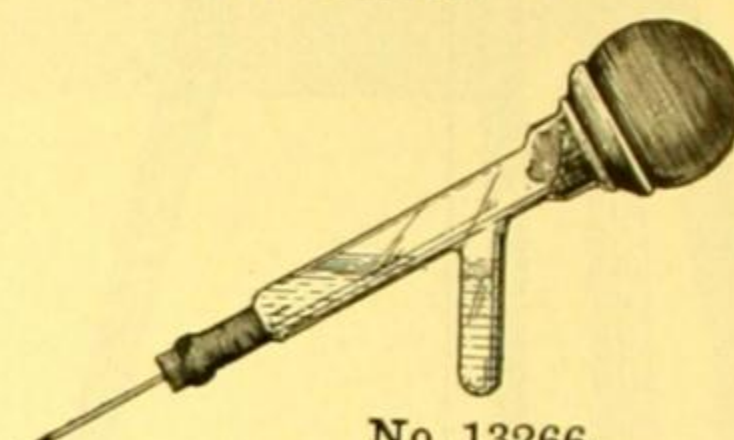
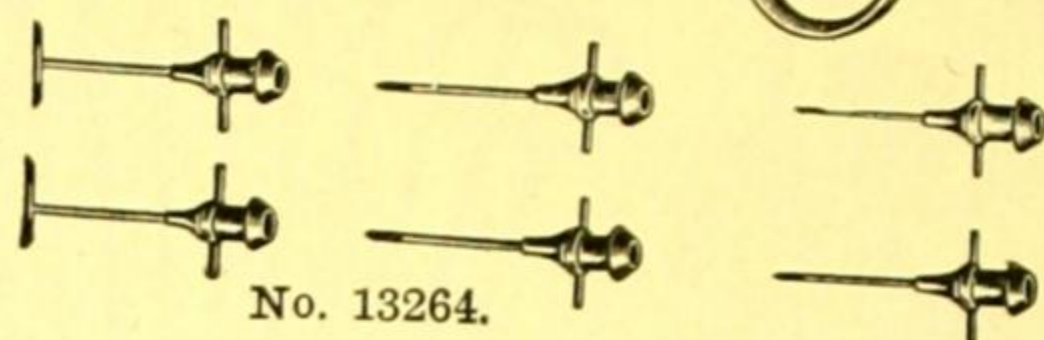
No. 13242.



No. 13246.



No. 13264.



No. 13266.

SYRINGES, ALL KINDS

SYRINGES, Hypodermic, Luer, all glass, entirely aseptic, without packing, threads or washers.
Easily sterilized. With slip-on needles.

	Capacity, cc	1	2	5	10	20	30
	Graduated in, cc	$\frac{1}{100}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{2}$	1	1
13240.	Syringe only, without needles	\$2.00	1.40	2.00	2.75	3.50	4.50
13241.	Syringe in pasteboard box, with two steel needles	2.50	1.65	2.50	3.25	4.00	5.50
13242.	Syringe in nickel-plated case, with two steel needles	3.25	2.50	3.50	4.25	5.75	7.25

13246. **SYRINGE, Hypodermic, Luer Assortment**, consisting of 16 assorted needles for bacteriological and serological work together with one each of the following syringes, in metal case:

- Luer Syringe, $\frac{1}{2}$ cc, graduated in $\frac{1}{40}$ th, for gray oil.
- Luer Syringe, 1 cc, graduated in $\frac{1}{100}$ th, for tuberculin.
- Luer Syringe, double scale, 25 minims and $1\frac{1}{2}$ cc in $\frac{1}{10}$ th, for subcutaneous injections.
- Luer Syringe, double scale, 30 minims and 2 cc in $\frac{1}{10}$ th, for subcutaneous injections.
- Luer Syringe, 5 cc, graduated in $\frac{1}{5}$ th, for antitoxins.
- Luer Syringe, 10 cc, graduated in $\frac{1}{5}$ th, for antitoxins and salvarsan.
- Luer Syringe, 20 cc, graduated in $\frac{1}{5}$ th, for antitoxins and salvarsan.

This outfit contains all of the syringes required for investigation or practical work in bacteriology or serology.

13248. **NEEDLES, Hypodermic, steel, slip-on type, for Luer Syringes.** 28.00

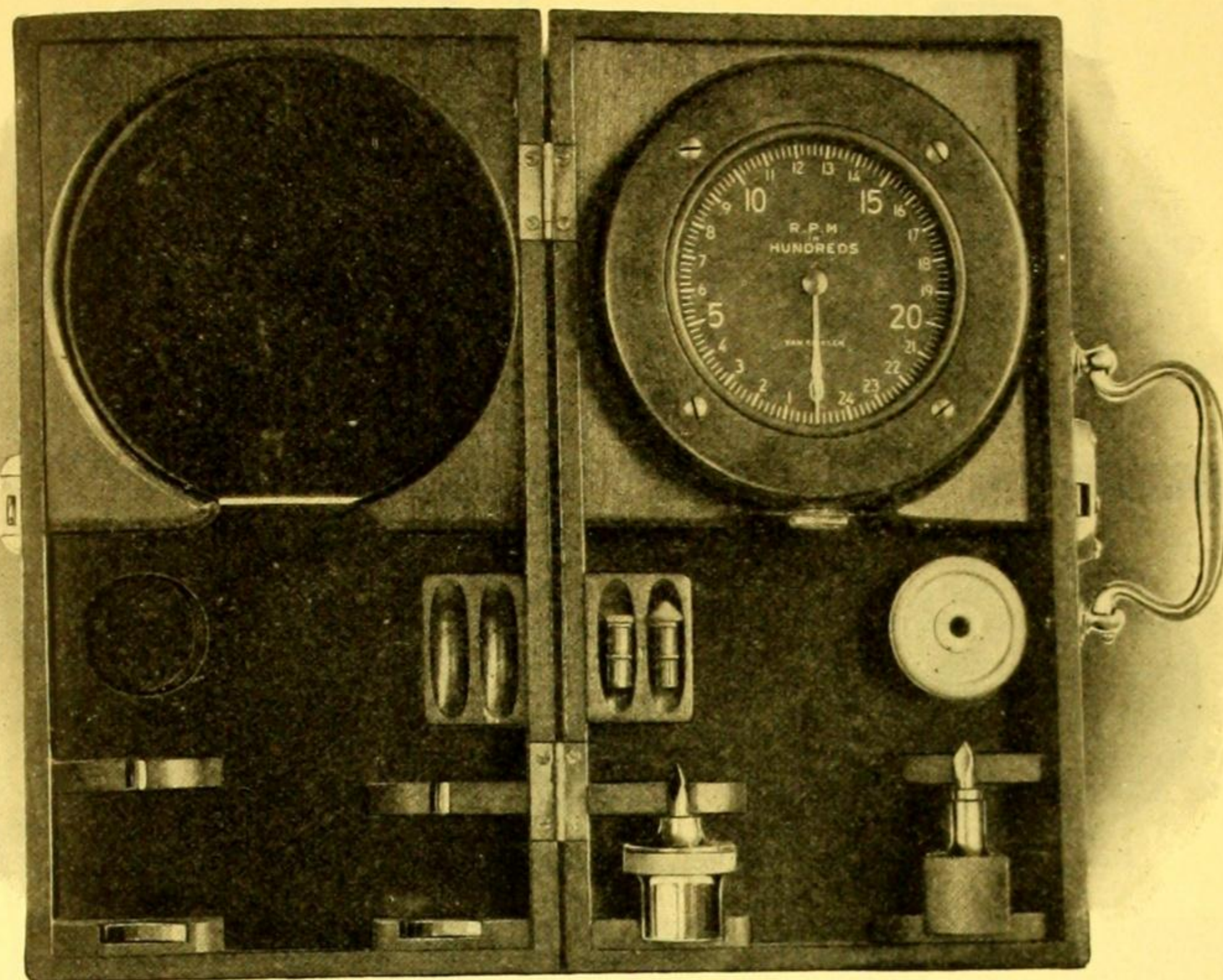
No.	A	B	C	D	E	F	G	H	J	K
Gage	26	26	24	24	24	22	22	20	20	18
Length, inches	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{2}$	2
Per dozen	1.75	1.75	1.75	1.75	2.00	2.25	2.25	2.25	2.25	2.75

Note:—Other needles not regularly carried in stock will be furnished upon short notice, in dozen lots only.

13264. **SYRINGE, Injecting**, of brass, nickel-plated; capacity, 45 cc. For use in injecting reagents and masses into different blood vessels. With two-way stop-cock, four straight canulae of different calibers, and two T canulae for injecting in both directions. Ends of canulae are grooved to prevent them from slipping out of vessels, and projections run out from base of canulae to fasten threads to. Complete as described, in wooden case with six canulae and stop-cock 8.00

13266. **SYRINGE, Injecting, Hitchen's Form**, for injecting precise amounts. The mixtures are made in the syringe barrel and enough sterile salt solution is placed in the side arm to wash in the entire dose. By this means the necessity for removing the bulb of the syringe during injection is dispensed with, and accuracy of dosage is insured. Made of resistance glass which can be readily sterilized. Complete with rubber bulb, rubber connection, and antitoxin needle. (For full description see Kolmer's Infection Immunity and Specific Therapy, page 233.)

13267. Glass Barrel only of No. 13266.	1.40
13268. Needles only of No. 13266.	.65
	per dozen 3.00



No. 13302 Tachometer Complete in Case.

13302. **TACHOMETER, Van Sicklen-Elgin Chronometric Precision.** This is the only tachometer available which is free from defects of the central pivot (centrifugal, magnetic) and vibration types. In the central pivot types the most serious drawback is the fact that they do not accommodate themselves rapidly to changes in speed—the time required being of the order of 30 seconds. Instantaneous speed is therefore not even approximated, which leads to considerable error when there is fluctuation in speed. The vibration type is extremely limited in its range if its indications are to be fairly precise. The Van Sicklen-Elgin Tachometer, manufactured by the Elgin Watch Company, has the following outstanding features:

1. The indicating hand is driven directly, by means of gears, by the shaft whose speed is to be measured.
2. The period of time through which the hand moves is measured off by an Elgin watch movement.
3. The indicated speed is the average speed over the first half-second of consecutive two-second intervals. Thus a very close approximation to instantaneous speed is secured.

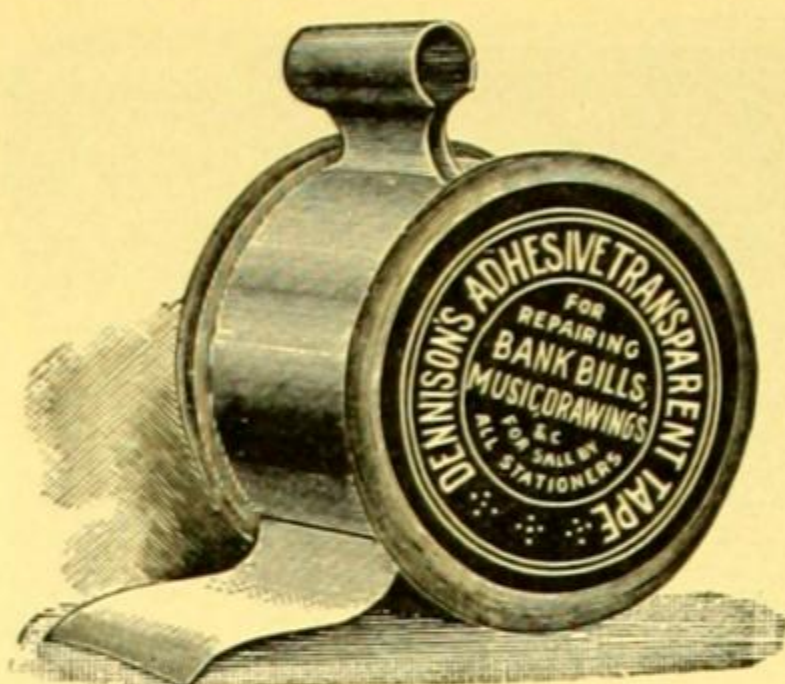
A consideration of these facts makes it plainly evident that the Van Sicklen-Elgin Tachometer is a precision tachometer, because its accuracy depends only upon the accuracy of the timing mechanism, and the name Elgin is a sufficient guarantee of that. A study of these same facts in the light of the scientific principles of tachometric design reveals the absence of the following defects fundamental in the design of other types:

1. There can be no inertia lag, either positive or negative, in a gear driven mechanism, such as this is.
2. Changes in external physical conditions such as temperature, pressure or mechanical vibrations cannot affect the gears. Compensation for changes in temperature, which is the only external influence materially affecting the timing mechanism, is easily effected, as it is an every day matter in watch manufacture.
3. Fluctuation of the indicating hand is impossible in a gear driven device.
4. There is no central pivot, the wear of which can displace any of the parts with relation to each other and thereby affect the accuracy of the readings.
5. The instrument has no period of its own which must accommodate itself to an acceleration impressed upon it.
6. The accuracy of the instrument is not affected by external vibrations.
7. The instrument is universal in application, being adapted to every purpose for which speed counters are employed.

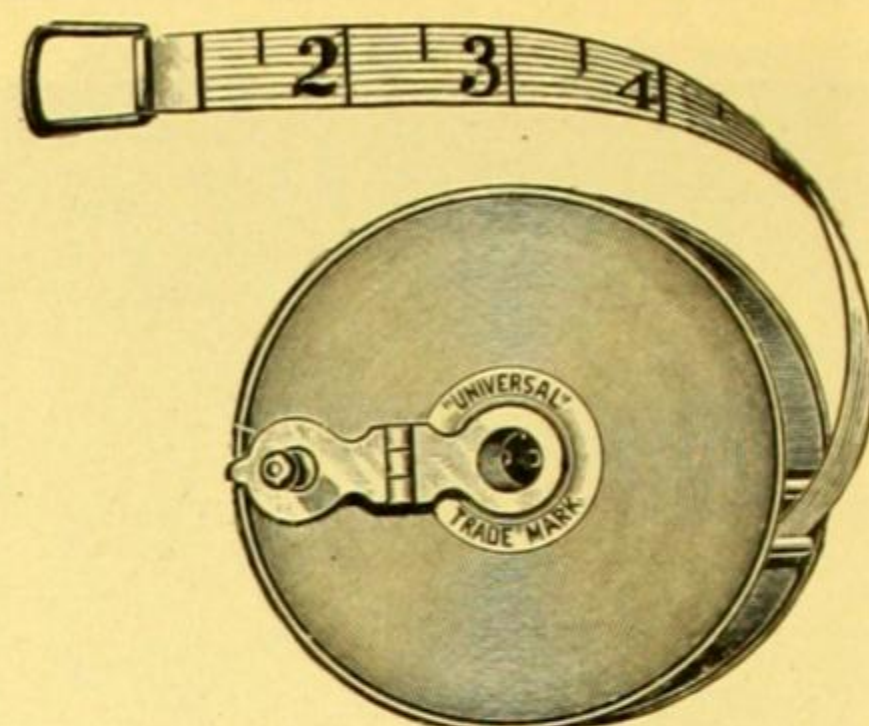
The details of construction and operation are completely described, with illustrations, in our Bulletin No. 81.

TACHOMETER, Van Sicklen Chronometric, as described, complete with two adapters and three adapter fittings, in plush lined mahogany carrying case with lock and key..... \$60.00

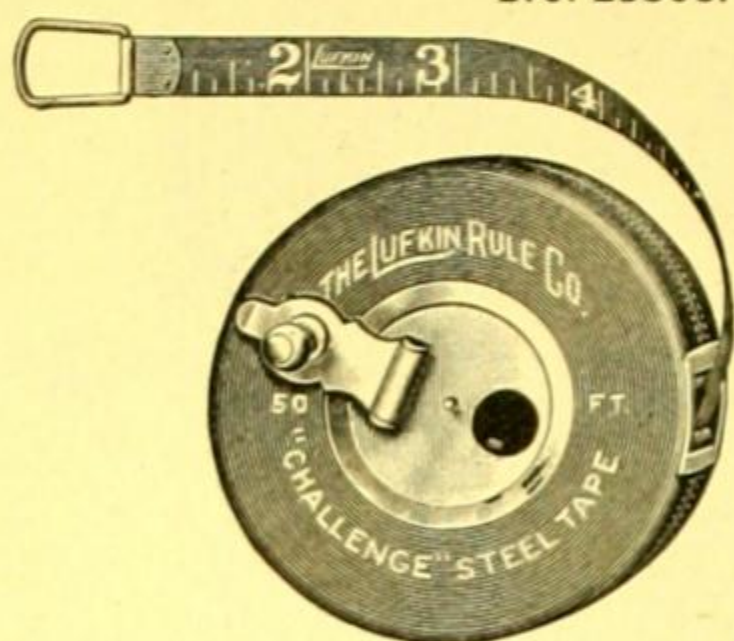
TALLY, Hand, see Counter No. 3319.



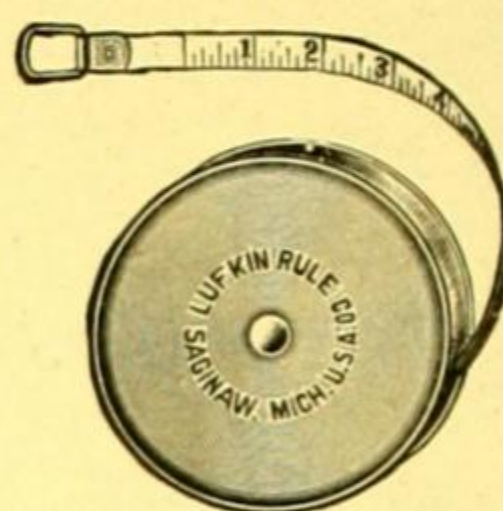
No. 13306.



No. 13312.



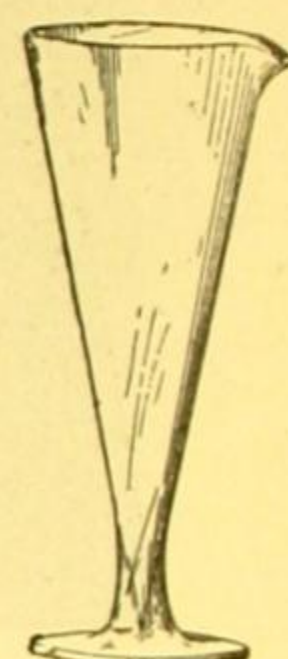
No. 13320.



No. 13324.

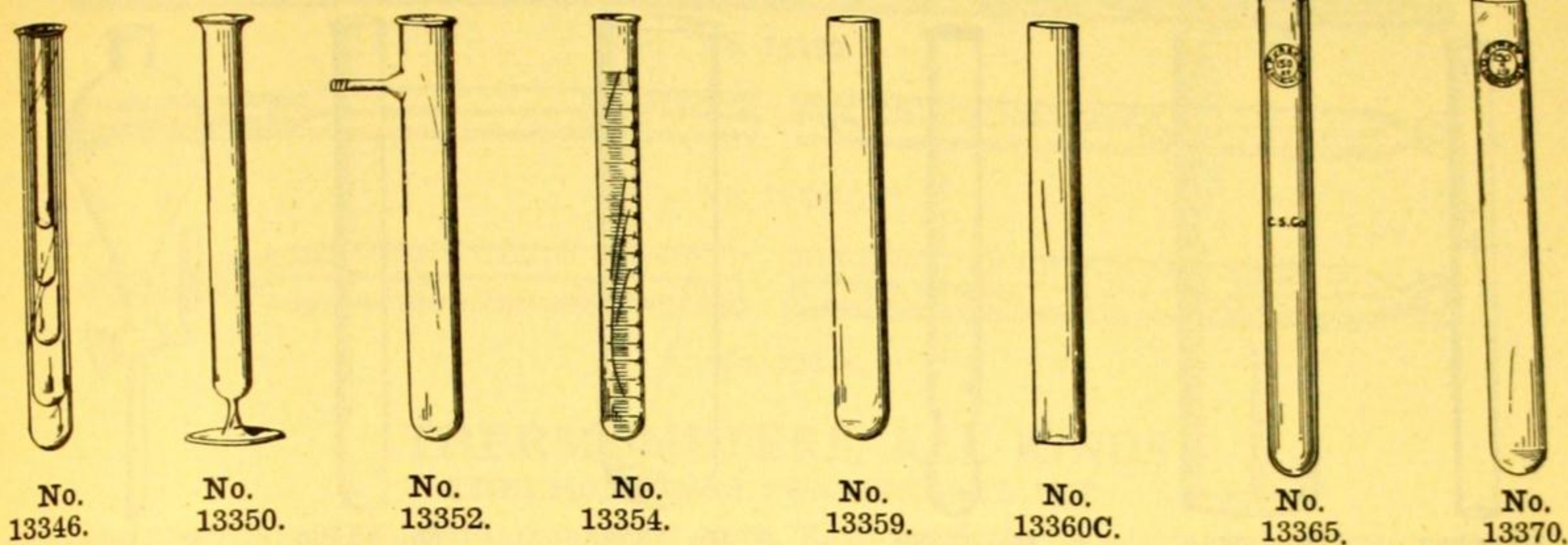


See Note on No. 13320.



No. 13332.

13306. **TAPE, Transparent Adhesive**, for mending pages of books, drawings, papers, maps, etc., $\frac{5}{8}$ inch wide; 4 yards on spool with metal holder.....per spool \$0.08
per carton of 36 spools 2.60
1536. **TAPE, Gummed Cloth**, heavy mending tape for strengthening books, pamphlets, maps, etc., $\frac{3}{4}$ inch wide. A 10 yard roll in special box with slot for drawing out as needed...per roll .40
- TAPE, Insulating**, see No. 5136.
13310. **TAPES, MEASURING, Linen, English**. Patent leather case, waterproof coated, with brass folding handle and trimmings. Tape $\frac{1}{2}$ inch wide, graduated in $\frac{1}{4}$ inches.
Length, feet 40 100
Each 1.50 3.00
13312. **TAPES, MEASURING, Linen, Metric**. Brass bound case and folding handle. Tape 13 mm wide, graduated in centimeters.
Length, meters 10 25
Each80 1.60
13314. **TAPES, MEASURING, Linen, English and Metric**. Nickel-plated brass case with spring wind and center stop. Tape $\frac{1}{4}$ inch wide, graduated in millimeters and $\frac{1}{8}$ inches. Length, 2 meters 1.20
13320. **TAPES, MEASURING, Steel, English**. Metal lined hard leather case, nickel-plated trimmings, folding winding handle opened by pressing pin on opposite side. Tape $\frac{3}{8}$ inch wide, graduated in feet, tenths, and hundredths.
Length, feet 50 100
Each 5.50 10.00
- Note:**—No. 13320 Measuring Tapes are provided with a new marking by means of which instantaneous readings of both feet and inches can be made without the necessity of referring back to the last entire foot. The method is well shown in the accompanying illustration.
13324. **TAPES, Measuring, Steel, English and Metric**, German silver case with spring wind and stop. Tape $\frac{1}{4}$ inch wide, graduated in millimeters and 16ths of an inch.
Length, meters 2 4
Each 1.50 4.00
- TAPERS, Wax**, see Wax Tapers.
- TAR TESTER**, see Asphalt and Tar Testing Apparatus.
13332. **TEST GLASSES**, conical form, with lip, for sedimentation.
Capacity, cc 30 60 125 175 250
Each35 .45 .55 .60 .80
- 10% discount in lots of 12.
- TESTING MACHINES**, for Paper Testing, see under general heading, Paper Testing.
- TEST PAPER**, see Paper.



TEST TUBES, ALL KINDS

13346. TEST TUBES, Thin Wall, ordinary glass, with lip, well annealed, free from lead, for chemical use.

No.	A	B	D	E	F	H	J
Length, inches	3	4	5	6	6	7	8
Diameter, inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
Per dozen	\$0.15	.17	.23	.24	.25	.43	.65
Per gross	1.45	1.65	2.30	2.35	2.40	4.30	6.35

10% discount from the gross price in lots of 12 gross

13350. TEST TUBES, Thin Wall, ordinary glass, with lip, on foot.

No.	B	C	D
Length, inches	5	6	8
Diameter, inches	$\frac{5}{8}$	$\frac{3}{4}$	1
Each	.14	.16	.20

10% discount in lots of 12.

13352. TEST TUBES, Thin Wall, ordinary glass, with lip, with side arm.

No.	B	C
Length, inches	6	8
Diameter, inches	$\frac{3}{4}$	1
Each	.10	.14

10% discount in lots of 12.

13354. TEST TUBES, Thin Wall, ordinary glass, with lip, graduated.

Capacity, cc	10	25
Graduated to, cc.	$\frac{1}{10}$	$\frac{1}{2}$
Each	.28	.50

10% discount in lots of 12.

13359. TEST TUBES, Thick Wall, ordinary glass, without lip, culture tubes for bacteriological work, so-called Board of Health tubes.

No.	A	B	C	D	E	F
Length, inches	3	4	5	6	6	8
Diameter, inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Per dozen	.17	.21	.28	.30	.31	.82
Per gross	1.75	2.15	2.85	3.00	3.10	8.25

10% discount from the gross price in lots of 12 gross.

13360C. TEST TUBES, Thick Wall, ordinary glass, without lip, flat bottomed, so-called specimen tubes. Length, 6 inches; diameter, $\frac{3}{4}$ inch.

Per dozen	.33
Per gross	3.30

13365. TEST TUBES, Thin Wall, Pyrex glass, with lip, for chemical work.

No.	A	B	C	D
Length, mm	100	125	150	200
Diameter, mm	12	15	18	25
Each	.07	.09	.12	.25

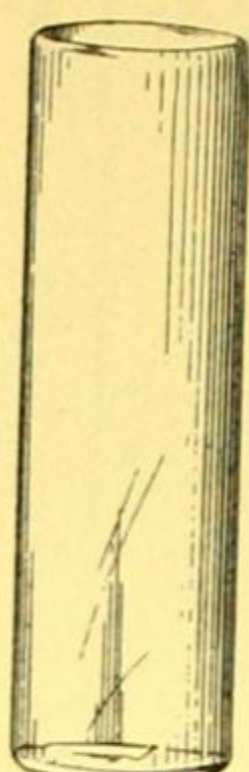
10% discount in lots of 100.

13370. TEST TUBES, Thick Wall, Pyrex glass, without lip, for combustion and ignition purposes, thickness of wall, about $1\frac{1}{2}$ mm.

No.	A	B	C	D
Length, mm	100	125	150	200
Diameter, mm	16	16	19	25
Per 10	1.10	1.30	2.20	3.40
Number in original carton	100	100	100	50
Per original carton	9.90	11.70	19.80	15.30



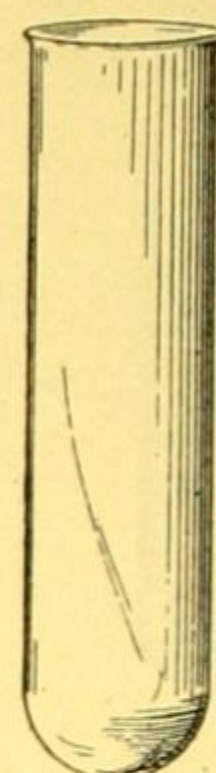
No. 9332.



No. 9334.



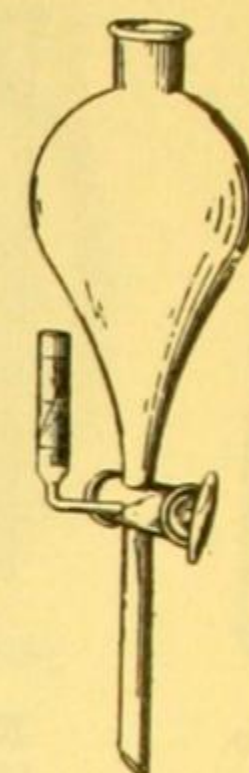
No. 13382.



No. 13386.



No. 13390.



No. 13400.

9332. **TEST TUBES**, Butter Fat Oil, with line 5 inches from bottom.....per dozen \$0.90
9334. **TEST TUBES**, Cream, heavy, for samples, 5x1¼ inchesper dozen 1.00
- TEST TUBES**, Ignition, with bulb at bottom, see **Reduction Tubes**.
13382. **TEST TUBES**, Potato Culture, ordinary glass, with lip, with constriction and bulb at the bottom. Length, 150 mm; diameter, 18 mm.....each .12
per dozen 1.20
13386. **TEST TUBE**, Titer Tube, ordinary glass, with lip, for determining the melting and solidifying points of fats and waxes. Length, 4 inches; diameter, 1 inch; thickness of wall, about 1 mm. (See Journal of the Association of Official Agricultural Chemists, Vol. II, No. 3, part II, November 15, 1916, page 303; Journal of Industrial and Engineering Chemistry, Vol. X, No. 4, for April 1918, page 317).....per dozen .25
per gross 2.50
13390. **TEST TUBES**, Wassermann, Thin Wall, non-corrosive glass, with lip, for serological work.
Length, mm 75 100
Diameter, mm 10 12
Per dozen25 .27
Per gross 2.50 2.70
- TEST TUBE BRUSHES**, see **Brushes**.
13400. **TEST TUBE FILLING ATTACHMENT**, for measuring out exact quantities of culture media and other chemical fluids. Consists of a separatory funnel with three-way stop-cock, to one arm of which is attached a graduated side tube. Capacity, 250 cc..... 5.00
- TEST TUBE HOLDERS**, see **Clamps**.
- TEST TUBE SUPPORTS**, see **Supports**.
- TEXTILE BALANCES, CONDITIONING OVENS**, etc., write for information.

THERMIT FOR LABORATORY EXPERIMENTS

We list the necessary equipments for a series of four interesting experiments with Dr. Goldschmidt's Thermit, a compound of a metallic oxide and granulated aluminum which, when ignited, starts a chemical reaction which will produce a temperature of 3000° C. This is now used extensively in welding fractures in iron castings and rails, as the molten thermit iron has the property of melting the surface of the iron it comes in contact with, and forming a solid mass.

13418. **THERMIT**, Experiment I. Welding a small piece of steel to a plate.
Steel Plate, ⅜ inch thick. 2 Cans Thermit.
2 Pouring Cups. Bottle Ignition Powder.
Pair Dark Glasses to protect Eyes.
Complete set 4.50
13419. **THERMIT**, Experiment II. Burning a hole through a plate.
Steel Plate, 9 inch square x ¾ inch thick. 4 Packages Plugging Material.
Tripod. Bottle Ignition Powder.
2 Cans Thermit. Pair Dark Glasses.
Tapping Spade. Large Crucible.
Shipping weight, 102 lbs.
Complete set 35.00
13424. **THERMIT**, black per 4 ounces .30
per pound .80
13425. **Ignition Mixture** (8 oz. smallest quantity sold)per pound 1.35
- THERMO-COUPLES**, see **Pyrometers**.



No. 13426.



No. 13438.



No. 13444.

THERMOMETERS, ALL KINDS

THERMOMETERS FOR GENERAL USE

13426. **THERMOMETERS, Centigrade, Solid Stem, Engraved Scale, for general use.** Diameter of stem, about $\frac{1}{4}$ inch. Graduated in 1° divisions.

No.	B	D	F
Range, degrees C.	-10 to 110	0 to 200	0 to 350
Length, inches	12	14	16
Each	1.10	1.35	1.60

10% discount in lots of 12, 20% discount in lots of 144.

13428. **THERMOMETERS, Fahrenheit, Solid Stem, Engraved Scale, same as No. 13426, but graduated in Fahrenheit scale, in 2° divisions**

No.	A	B	C
Range, degrees F.	10 to 220	30 to 400	30 to 650
Length, inches	12	14	16
Each	1.10	1.35	1.60

10% discount in lots of 12, 20% discount in lots of 144.

13430. **THERMOMETERS, Double Scale, Solid Stem, Engraved Scale, same as No. 13426, but with double scale.**

No.	A	B
Range, degrees C.	-10 to 110	0 to 200
Range, degrees F.	10 to 220	30 to 400
Each	1.50	2.00

10% discount in lots of 12, 20% discount in lots of 144.

13436. **THERMOMETERS, Enclosed Milk Glass Scale, diameter 8 to 10 mm, with Centigrade scale.**

No.	A	B	C
Range, 0° to, degrees C.	110	200	350
Each	1.25	1.50	2.00

10% discount in lots of 12, 20% discount in lots of 144.

13438. **THERMOMETERS, Solid Stem, Engraved Scale, with fractional divisions, for general laboratory work where highest degree of precision is not required. With Centigrade scale. Diameter, about 7 mm.**

No.	B	C	D	F
Range, degrees C.	0-50	0-100	0-100	0-200
Size of subdivisions, degrees C.	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{5}$
Length, cm	38	40	60	60
Each	4.30	4.30	5.00	5.30

13443. **THERMOMETERS, Centigrade, High Range, Solid Stem, Engraved Scale, filled with nitrogen above the mercury. Diameter, about 7 mm.**

No.	A	B	C
Range, degrees C.	0-360	100-400	100-550
Size of subdivisions, degrees C.	1	2	2
Length, cm	40	40	40
Each	2.35	3.50	5.00

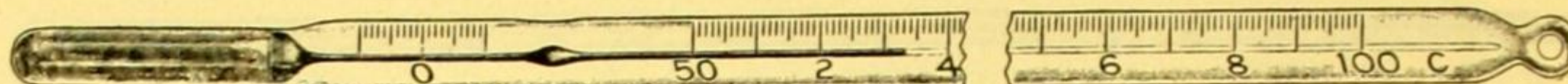
13444. **THERMOMETERS, Fahrenheit, High Range, same as No. 13443, but graduated in Fahrenheit scale.**

No.	A	B
Range, degrees F.	200-750	200-950
Size of subdivisions, degrees F.	5	5
Length, cm	40	40
Each	3.50	5.00

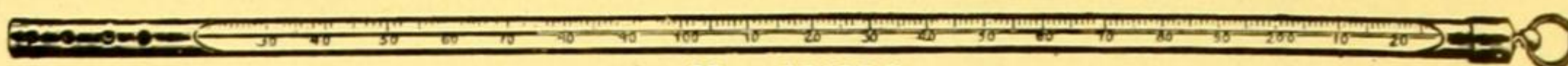
13454. **THERMOMETER, Low Range, Solid Stem, Engraved Scale, Alcohol Filled, for low temperatures. Range, -50° to $+50^\circ$ C., in $\frac{1}{5}^\circ$ divisions. Length, about 30 cm; diameter about 8 mm.**

13456. **THERMOMETER, Low Range, Solid Stem, Engraved Scale, Pentane Filled, for very low temperatures. Range, -200° to $+50^\circ$ C., in 1° divisions. Length, about 35 cm; diameter, about 10 mm.**

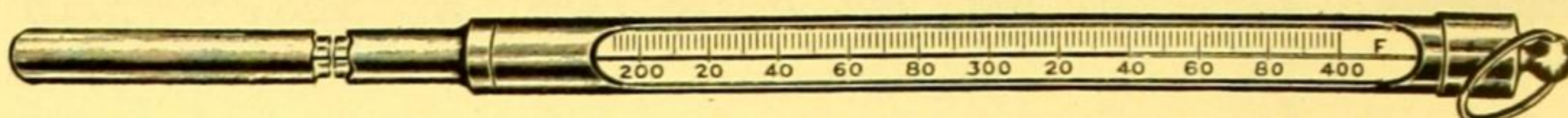
13458. **THERMOMETER, Low Range, Solid Stem, Engraved Scale, Toluol Filled, for low temperatures. Range, -100° to $+50^\circ$ C., in 1° divisions. Length, about 30 cm.**



No. 13464.



Nos. 13496-8.



No. 13506.

THERMOMETERS, NORMAL OR PRECISION

13464. **THERMOMETERS**, Normal or Precision, Solid Stem, Engraved Scale, for precision measurements where highest accuracy is essential. Thermometers reading above 250°C. are filled with nitrogen. Graduated according to the requirements of the United States Bureau of Standards. Without certificate.

No.	A	B	C	D	E	F
Range, degrees C.	-15 to 50	-15 to 100	-5 to 105	-10 to 110	0 to 250	0 to 300
Size of subdivisions, deg. C.	1/10	1	1/5	1/10	1/2	1
Length, cm	38	30	38	60	45	45
Each	9.50	4.75	8.00	15.00	7.50	6.75

13465. **THERMOMETERS**, Normal or Precision, same as No. 13464, but standardized by the United States Bureau of Standards, with certificate.

No.	A	B	C	D	E	F
Each	12.50	7.00	11.00	18.00	10.50	9.75

13486. **THERMOMETER**, Titer Test, Solid Stem, Engraved Scale, according to the requirements of the Association of Official Agricultural Chemists. Range, 10° to 65° C., in 1/10° divisions with zero point marked, and with reservoirs at upper end and between 0° and 10° marks. Length of thermometer, 38 cm; length of bulb, 3 cm; distance between top of bulb and 10° mark, 3 to 4 cm; diameter of stem and bulb, about 6 mm. (See Journal of the Association of Official Agricultural Chemists, Vol. II, No. 3, Part II, November 15, 1916, page 302; Journal of Industrial and Engineering Chemistry, Vol. X, No. 4, for April 1918, page 317)..... 8.00

THERMOMETERS FOR SPECIAL USES

13496. **THERMOMETERS**, Armored, Solid Stem, Engraved Scale, with armor of seamless steel tubing, nickel-plated, with lower end perforated around bulb to permit circulation. Thermometer is suspended from screw cap and easily removed. Scaled for 3 inch immersion.

No.	A	B	D	E
Range, degrees F.	0-220	30-400	30-750	100-950
Size of subdivisions, degrees F.	2	2	2	5
Length inches	12	14	16	16

13497. **THERMOMETERS**, extra, for replacement in No. 13496.

No.	A	B	D	E
Each	4.25	5.00	6.00	9.50
No.	A	B	D	E
Each	2.00	2.50	3.75	6.75

13498. **THERMOMETERS**, Armored, same as No. 13496, but with Centigrade scale.

No.	B	D	E
Range, degrees C.	0-200	0-400	50-510
Size of subdivisions, degrees C.	1	1	2
Length inches	14	16	16
Each	5.00	6.00	9.50

13499. **THERMOMETERS**, extra, for replacement in No. 13498.

No.	B	D	E
Each	2.50	3.75	6.75

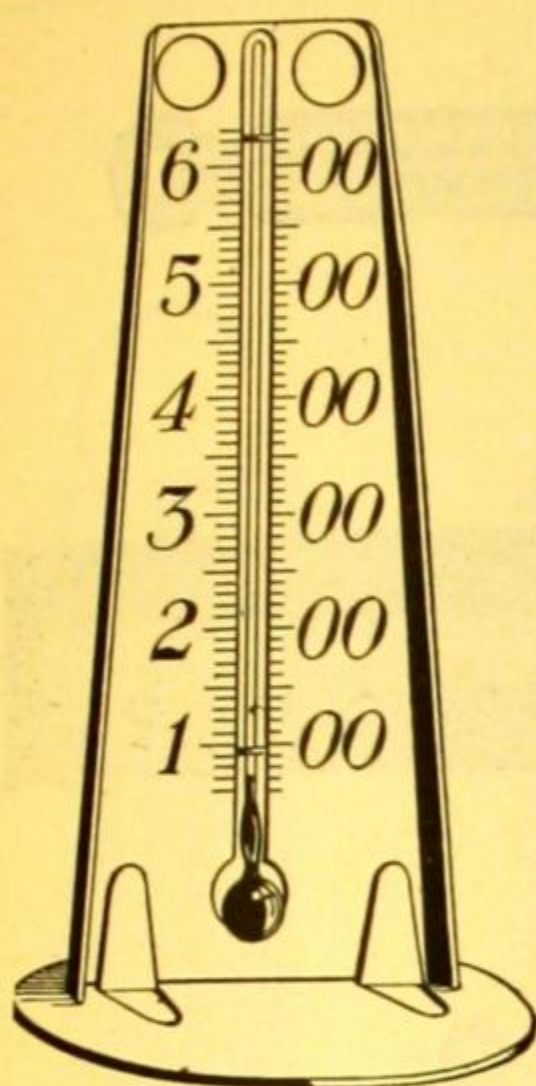
13506. **THERMOMETERS**, Armored, Asphalt, with Protected Bulb, and engraved stem. The bulb is immersed in a bath of mercury contained in the long slender steel cup forming the stem, affording protection and making it almost as quick reading as a bare glass bulb. Length of case, 10 inches. No.

No.	A	B
Range, degrees F.	200-400	200-650
Size of subdivisions, degrees F.	2	5
Each	8.00	11.00

13507. **THERMOMETERS**, extra, for replacement in No. 13506.

No.	A	B
Each	4.00	7.00

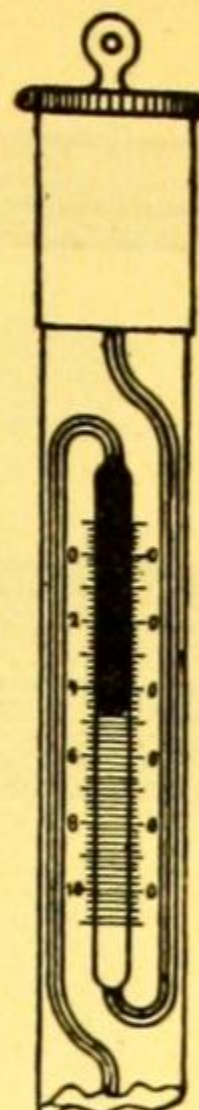
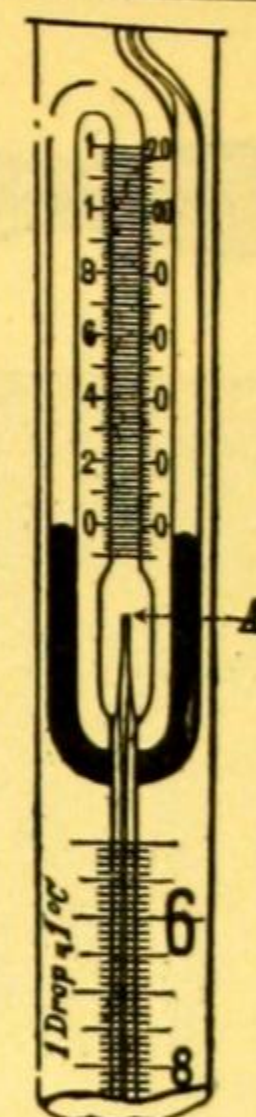
13512. **THERMOMETER**, Asphalt Drying Oven, Solid Stem, Engraved Scale, graduated from 150° to 175° C. in 1° divisions, for determining the loss on heating of asphaltic compounds. Length, about 6 inches. Scaled for total immersion. (According to American Society for Testing Materials Specifications for 1921, No. D6-20)..... 5.00



No. 13514.



Nos. 13518-9.

Nos. 13518-9.
(Auxiliary Scale.)No. 13522.
(Showing Method of
Adjusting Temperature.)

13514. **THERMOMETER, Bake Oven, Medium Grade**, consisting of a glass tube, mercury-filled, mounted on 5-inch flanged metal scale with sand blast finish and white figures. With round removable base with asbestos mat attached. Range, about 100° to 600° F. \$2.00

THERMOMETER, Beckmann, for the exact determination of slight changes in temperature. Widely used in calorimetry and in boiling and freezing point determinations. Consists of a capillary of normal glass graduated to 1/100 degree over a range of 5° or 6° C., with an auxiliary scale at the top graduated from -10° to 120° C., in 2° divisions, sealed in a glass jacket with metal cap. The thermometer may be set to read at any temperature between -10° and 120° C. Constructed and graduated according to the requirements of the United States Bureau of Standards.

13518. Without certificate 15.00
13519. With Bureau of Standards certificate 30.00

THERMOMETER, Beckmann, improved, similar to No. 13518, but with improved method of adjustment of temperature. In the reservoir beneath the auxiliary scale is a short capillary (a), the opening of which is adjusted to deliver a drop of mercury of sufficient size to produce a fixed change of temperature in degrees C., the exact amount of this change being engraved on the scale of the thermometer. This improved construction obviates the necessity of tapping the mercury column, with the consequent danger of breakage. It also makes easier the return of excess mercury from the reservoir to the bulb which takes place automatically if the thermometer is held in a perpendicular position. Mercury from the reservoir may be transferred to the side arms by merely inclining the thermometer. Graduated according to the requirements of the United States Bureau of Standards.

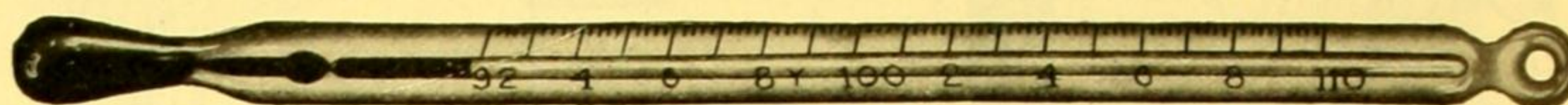
13522. Without certificate 17.00
13523. With Bureau of Standards certificate 32.50

- 13529A. **THERMOMETER, Calorimeter, Solid Stem, Engraved Scale, Precision Grade**, as used with oxygen bomb calorimeters. Graduated from 18° to 30° C. in 1/50° divisions. Length, 18 inches. With Bureau of Standards Certificate 30.00

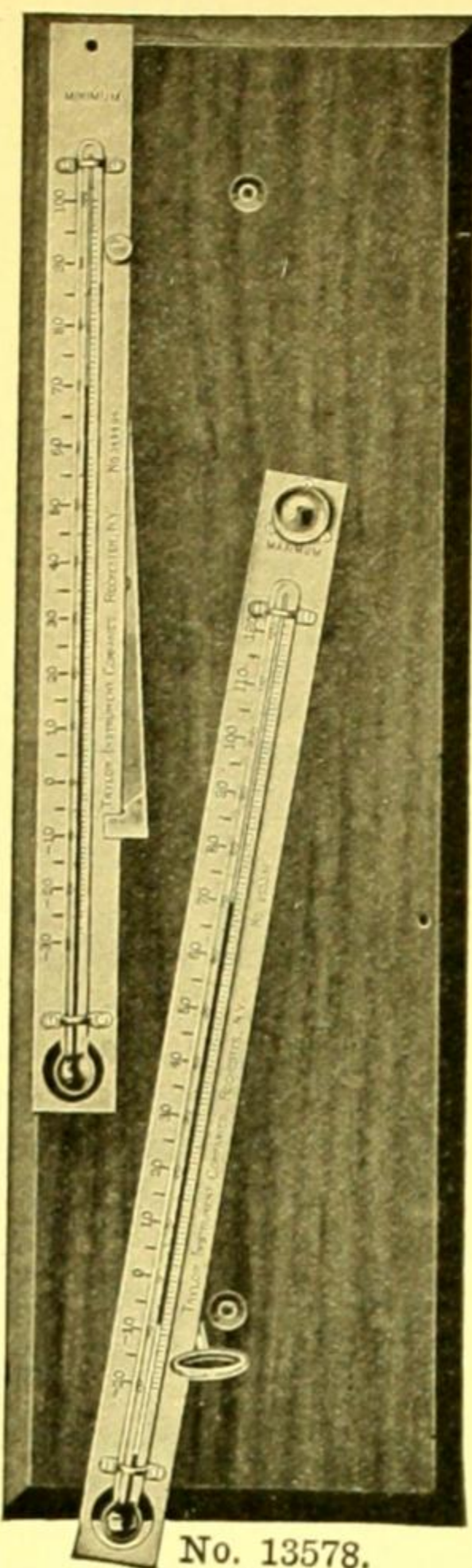
13533. **THERMOMETERS, Calorimeter, Solid Stem, Engraved Scale**, as used with Parr Calorimeters. Graduated to meet the requirements of the United States Bureau of Standards. With Bureau of Standards Certificate.

No.	A	B
Range, degrees F.	65 to 90	65 to 105
Size of subdivisions, degrees F.	1/20	1/20
Each	12.00	15.00

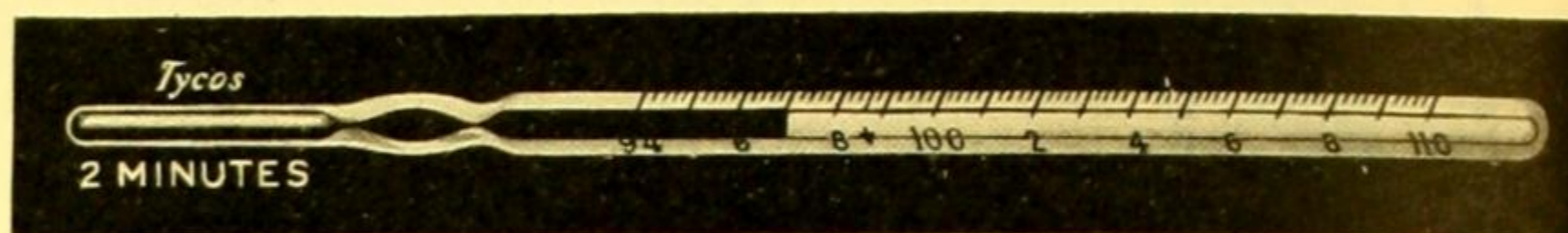
13540. **THERMOMETER, Gas Calorimeter, Solid Stem, Engraved Scale, high grade**. Graduated from 30° to 150° F., in 1/10° divisions. 9.50



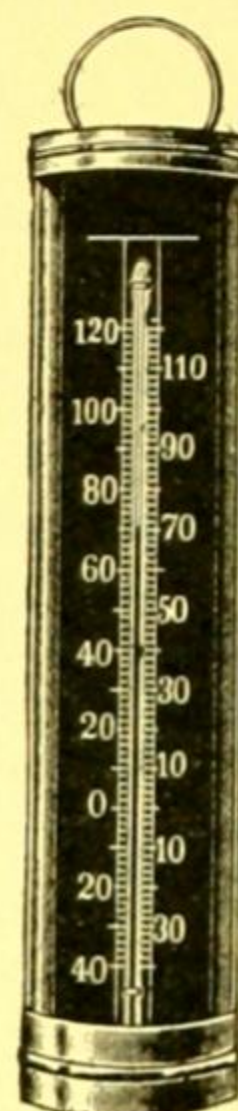
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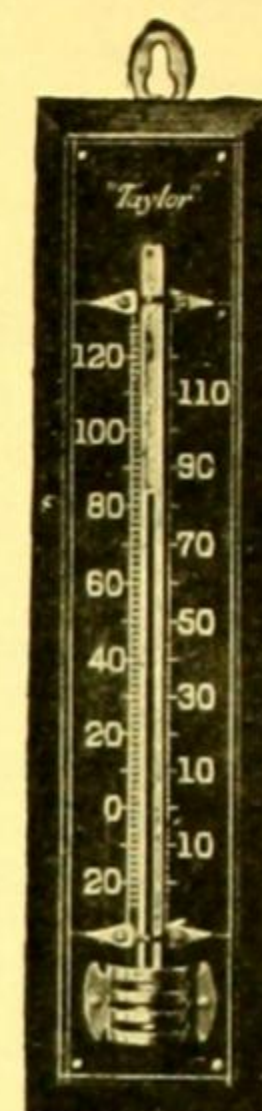
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No. 13546.

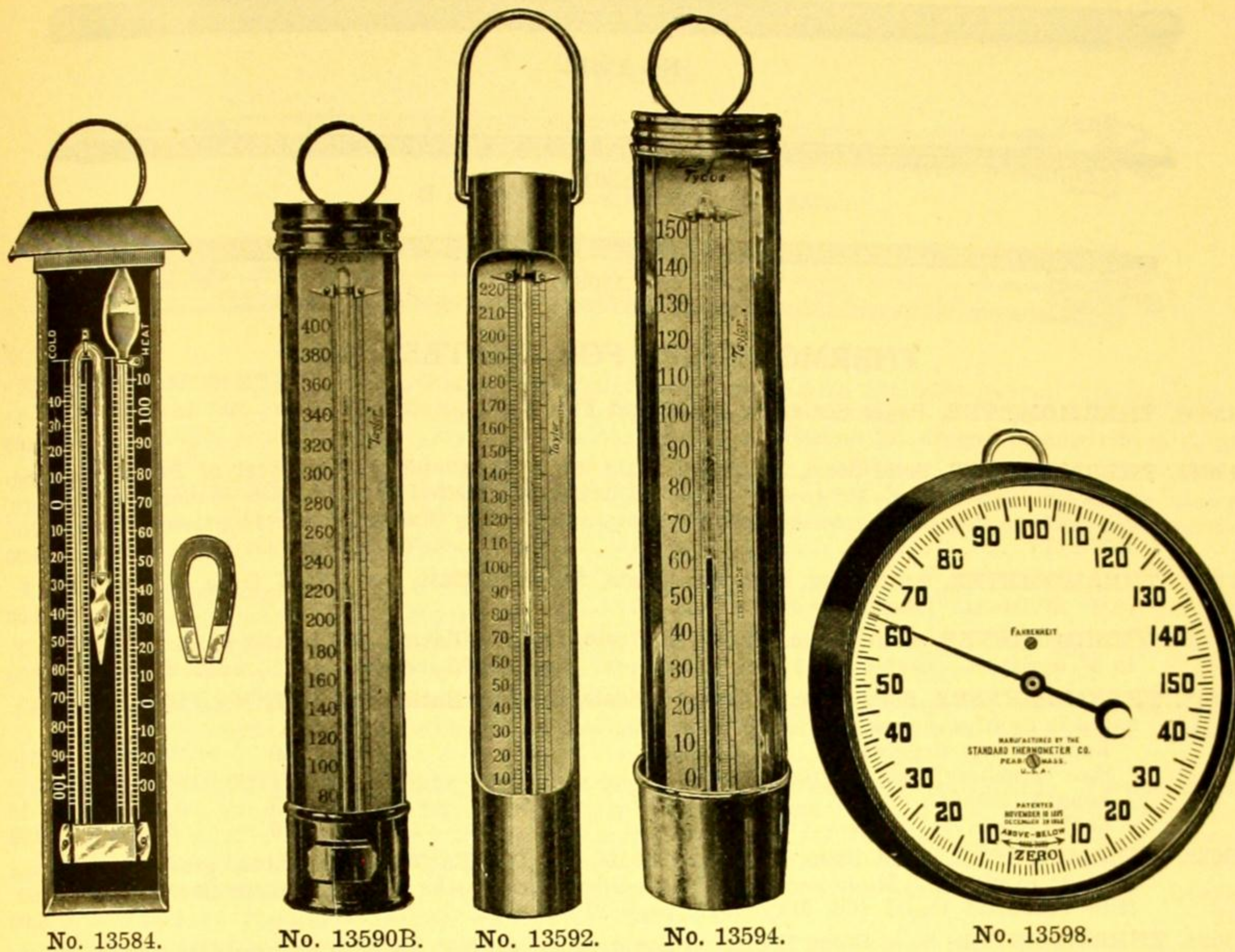


No. 13562.



No. 13564.

13546. THERMOMETER, Clinical, One Minute, first grade, with magnifying tube, in hard rubber case with factory certificate. 1.80
13548. THERMOMETER, Clinical, Veterinary, first grade, pear-shaped bulb, ring top, with magnifying tube, in hard rubber case, with factory certificate. 1.80
- THERMOMETERS, Dairy, see Milk Testing Apparatus.
13562. THERMOMETER, Household, standard grade, 10 inch, heavy japanned tin case, accurately tested. Approximate range,—20° to 120° F. 2.00
13564. THERMOMETER, Household, 8 inch, metal scale, oak back, beveled edge, with brass guard over bulb. Approximate range,—20° to 120° F. 1.40
13568. THERMOMETER, Incubator, with enlargement in stem to prevent slipping through hole in stopper. Length, about 20 cm. Distance from bottom of bulb to enlargement 4½ inches. Range, 0° to 50° C., in 1° divisions. 3.00
13569. THERMOMETER, Incubator, Enclosed Milk Glass Scale, graduated from 0° to 70°C. in 1° divisions. Length, about 22 inches, with zero point of scale 12 inches from bulb. 5.00
13578. THERMOMETERS, Maximum and Minimum Registering, U. S. Weather Bureau Pattern, with graduations etched on stem over a range of approximately — 20° to 120° F. The thermometers are mounted on 12 inch aluminum strips on which is marked every 5 degree line of the scale, and the figures every 10 degrees. The aluminum strips are insulated from the wood back by a brass insulating support and fastened by brass knurled screws. Mounted on mahogany finished back, 17x5 inches. With manufacturer's certificate for each thermometer.
13579. Thermometer, Maximum, only for No. 13578. With manufacturer's certificate. 6.00
13580. Thermometer, Minimum, only for No. 13578. With manufacturer's certificate. 6.00



13584. **THERMOMETER**, Maximum and Minimum Registering, Six's Pattern, in japanned tin case with metal scale. Length, 8 inches; approximate range, -20° to 120° F. Complete with horseshoe magnet for resetting. \$6.20

13586. **THERMOMETER**, Melting Point of Bituminous Materials, solid stem, engraved scale, graduated from 0° to 80° C. in $1/5^{\circ}$ divisions. Scaled for 3 inch immersion. Length, 15 inches. (According to American Society for Testing Materials Specifications, No. D36-21) 8.00

13587. **THERMOMETER**, Melting Point of Bituminous Materials, same as above but graduated from 30° to 160° C. in $1/2^{\circ}$ divisions. Length 15 inches 5.00

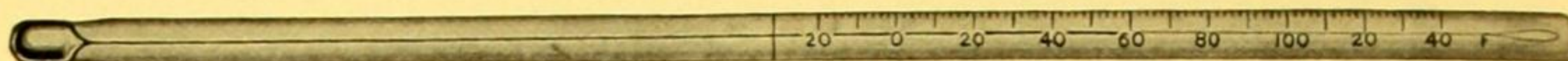
13590B. **THERMOMETER**, Metal Scale, highest grade, with scale of oxidized brass in black japanned tin case. Range, 0° to 220° F. Length, 10 inches 2.00

13592. **THERMOMETER**, Metal Scale, with Copper Cup, highest grade, for determining the average temperature of oil or other liquids in tank cars or tanks and securing a sample at the same time. Range, 10° to 220° F. Length, 12 inches 3.90

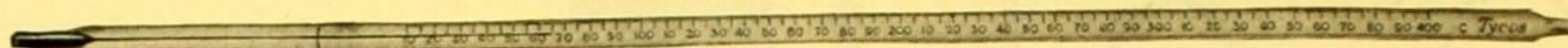
13594. **THERMOMETER**, Metal Scale, Sugar Factory, standard grade, with magnifying tube filled with mercury, silvered brass scale with black figures, and brass screw clamps. Bottom of copper case is closed to permit samples to be taken. Length, 12 inches. Range, about 0° to 150° Centigrade 3.50

THERMOMETERS, Metal Frame, Straight and Angle Stem, for steam boilers, water heaters, oil stills, etc. Send for special bulletin.

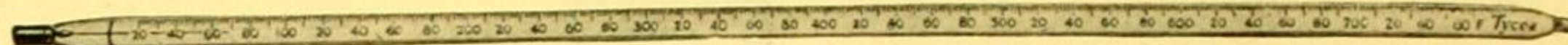
13598. **THERMOMETER**, Metallic, Demonstration Form, with glass back to show the internal mechanism, which consists of a strip of two metals soldered together and connected with an index hand by a multiplying lever. Diameter 6 inches. Range, -50 to 150 degrees F. 4.30



No. 13612.



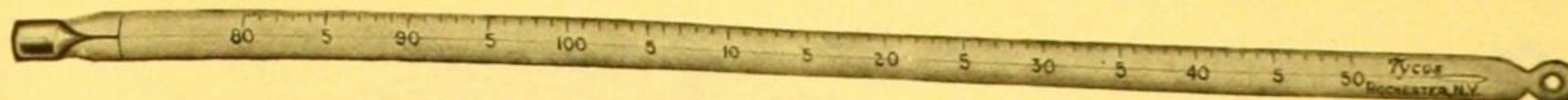
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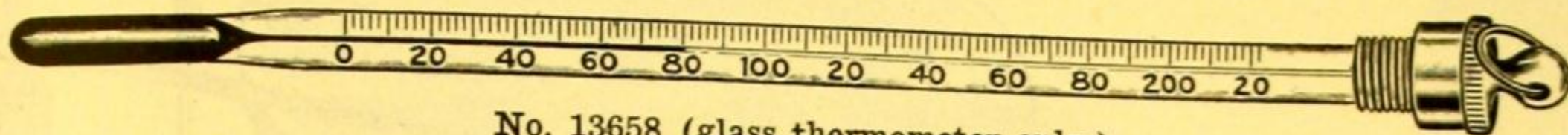
No. 13636.

THERMOMETERS FOR OIL TESTING

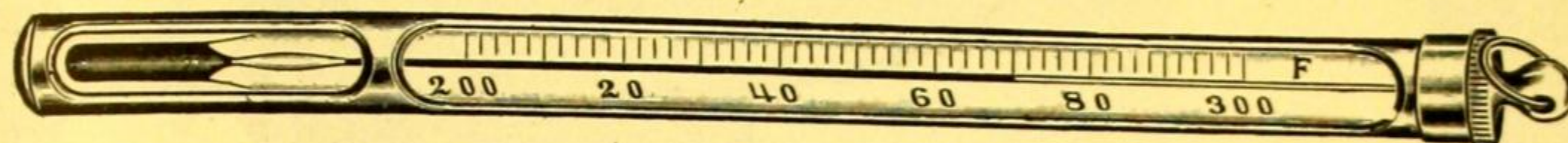
13608. **THERMOMETER**, Paper Scale, for Flash and Fire Test, graduated from -20° to 230° F., in 1° divisions. Length, 12 inches. \$4.00
13612. **THERMOMETER**, Solid Stem, Engraved Scale, for Cold, Cloud or Pour Test of Petroleum Products, graduated from -36° to 120° F. in 2° divisions. Scaled for $4\frac{1}{4}$ inch immersion. Length, $8\frac{3}{4}$ inches. (According to American Society for Testing Materials Specifications for 1921, No. D97-21T) 3.00
13613. **THERMOMETER**, Solid Stem, Engraved Scale, for Cold Test, graduated from -40° to 100° F., in 1° divisions. Length, 30 cm. 2.00
- 13616B. **THERMOMETER**, Solid Stem, Engraved Scale, for Distillation, graduated from 30° to 750° F. in 2° divisions. Scaled for 3 inch immersion. Length, 15 inches. 7.00
13618. **THERMOMETERS**, Solid Stem, Engraved Scale, for Distillation. Same as No. 13616B, but graduated in Centigrade scale. No. A B C
 Range, 0° to, degrees C. 200 400 510
 Size of subdivisions, degrees C. 1 1 2
 Length, inches 15 15 16
 Each 5.00 7.00 10.00
13622. **THERMOMETER**, Solid Stem, Engraved Scale, for Distillation of Gasoline, graduated to read from 0° to 270° C. Made according to specifications of the United States Bureau of Mines. (See Technical Paper 166, May 1917, page 21) 5.00
13624. **THERMOMETER**, Solid Stem, Engraved Scale, same as No. 13622, but graduated from 20° to 520° F. in 2° divisions. 5.00
13626. **THERMOMETER**, Solid Stem, Engraved Scale, for Distillation of Gasoline or Creosote Oil, graduated from 0° to 400° C. in 1° divisions. Scaled for 3 inch immersion. Length, 15 inches. (According to American Society for Testing Materials Specifications for Gasoline No. D86-21T, and for Creosote Oil, No. D20-18) 7.00
13627. **THERMOMETER**, Solid Stem, Engraved Scale, for Distillation of Gasoline, same as No. 13626, but graduated from 30° to 760° F. in 2° divisions. Length, 15 inches. 7.00
13628. **THERMOMETER**, Solid Stem, Engraved Scale for Distillation of Gasolines with Lower Boiling Points, same as No. 13626, but graduated from 0° to 300° C. in 1° divisions. Length, 15 inches 5.00
13629. **THERMOMETER**, Solid Stem, Engraved Scale, for Distillation of Gasoline, same as No. 13628, but graduated from 0° to 580° F. in 2° divisions. Length, 15 inches. 5.00
9663. **THERMOMETERS**, Solid Stem, Engraved Scale, for Flash Test, for use in oil cup of No. 9662 Bureau of Mines Flash Tester. Graduated in $\frac{1}{2}$ degree divisions.
 No. A B
 Range, degrees C. 10-50 40-110
 Each 6.00 6.00
9682. **THERMOMETERS**, Solid Stem, Engraved Scale, for Flash Test. Scaled for $2\frac{1}{4}$ inch immersion. With metal ferrule.
 No. A B C
 Range, degrees 20-230F 10-110C 200-700F
 For tester No. 9668-80 9681 9668
 Size of subdivisions, degrees 1 1 5
 Each 4.25 4.50 8.25
13632. **THERMOMETER**, Solid Stem, Engraved Scale, for Flash and Fire Test, for high flashing lubricating oils in connection with the Cleveland Flash Point Tester, graduated from 20° to 760° F. in 5° divisions. Scaled for 1 inch immersion. Length, 12 inches. (According to American Society for Testing Materials Specifications, No. D92-21T) 7.00
13636. **THERMOMETERS**, Solid Stem, Engraved Scale, for Flash and Fire Test, pointed for 1 inch immersion. Length, 15 inches. No. B D G
 Range, 20° to, degrees F. 300 500 760
 Size of subdivisions, degrees F. 1 2 2
 Each 3.00 4.75 7.00



No. 13652.

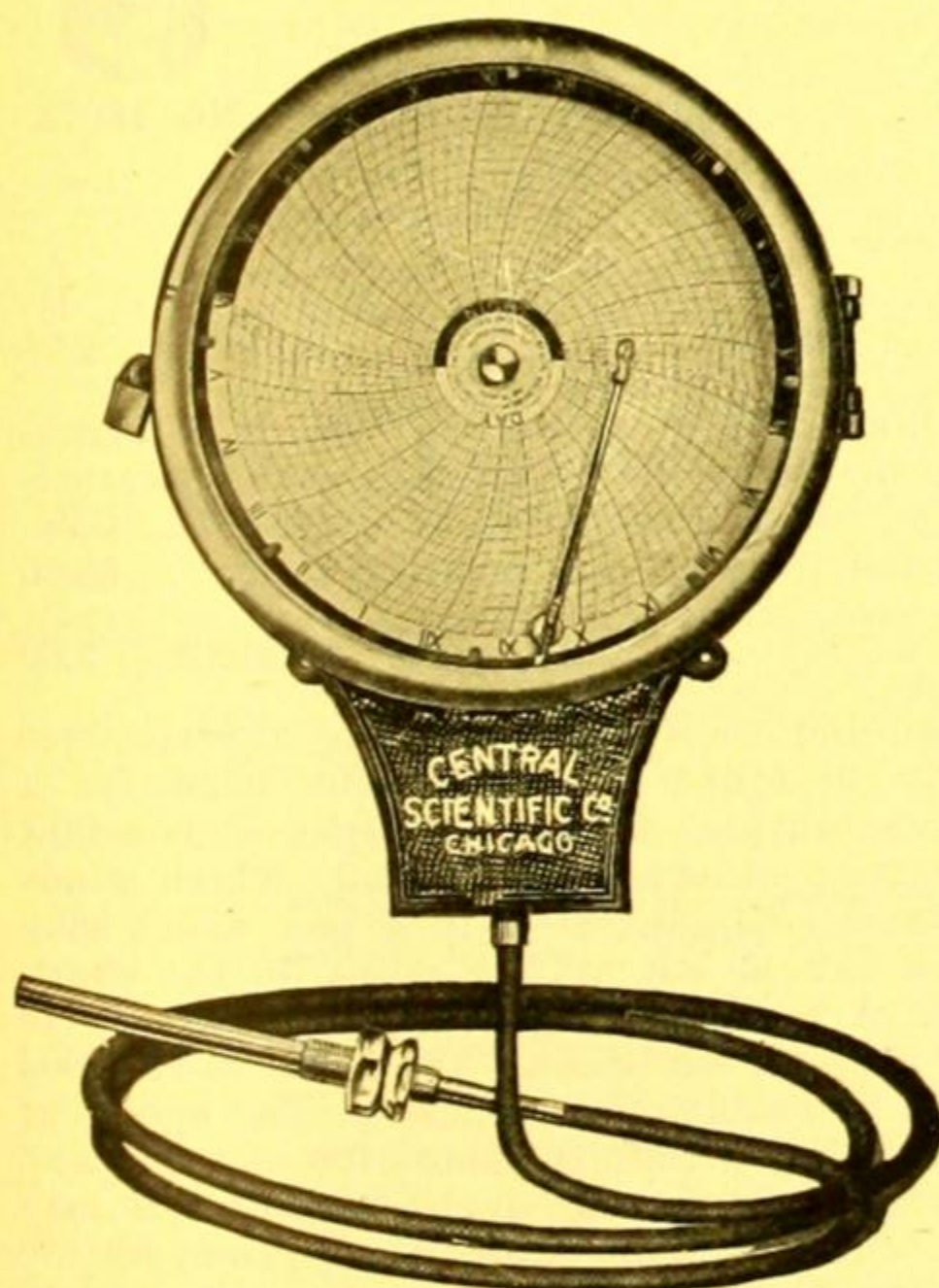


No. 13658 (glass thermometer only.)



No. 13662.

9762. **THERMOMETERS, Solid Stem, Engraved Scale**, for use with No. 9760 Saybolt Viscosimeter.
- | No. | A | B | C |
|-------------------|-----------|------------|------------|
| Range, degrees F. | 70 to 110 | 100 to 140 | 180 to 220 |
| Each | 2.50 | 2.50 | 2.50 |
- THERMOMETERS, Solid Stem, Engraved Scale**, for use with Engler and Ubbelohde viscosimeters. Graduated to meet the requirements of the Bureau of Standards. Length, about 8 inches. With brass ferrule.
- | No. | A | B | C |
|----------------------------------|-------|--------|--------|
| Range, degrees C. | 10-50 | 10-150 | 10-200 |
| Size of subdivisions, degrees C. | 1 | 1 | 1 |
13644. **Without Certificate** 5.25 5.25 6.25
13645. **With Bureau of Standards certificate** 7.00 7.15 8.25
13652. **THERMOMETER, Solid Stem, Engraved Scale, for Wax Test**, graduated from 80° to 150° F., in 1/4° divisions, for determining the melting point of waxes, paraffines, and greases. Length, 10 inches 4.00
13653. **THERMOMETER, Solid Stem, Engraved Scale, for Melting Point of Waxes, Paraffines and Greases**, graduated from 80° to 160° F. in 1/5° divisions. Scaled for 3 1/4 inch immersion. Length, 14 1/2 inches. (According to American Society for Testing Materials Tentative Specifications for 1921, No. D87-21T) 8.00
13658. **THERMOMETER, Pocket, Solid Stem, Engraved Scale**, in spiral-ribbed aluminum case. Length, 5 inches. Range, 0° to 220° F., in 2° divisions 2.50
13662. **THERMOMETER, Pocket, Maximum Registering, Solid Stem, Engraved Scale**, in aluminum case. Length, 5 inches. Range, 0° to 220° F., in 2° divisions 5.00



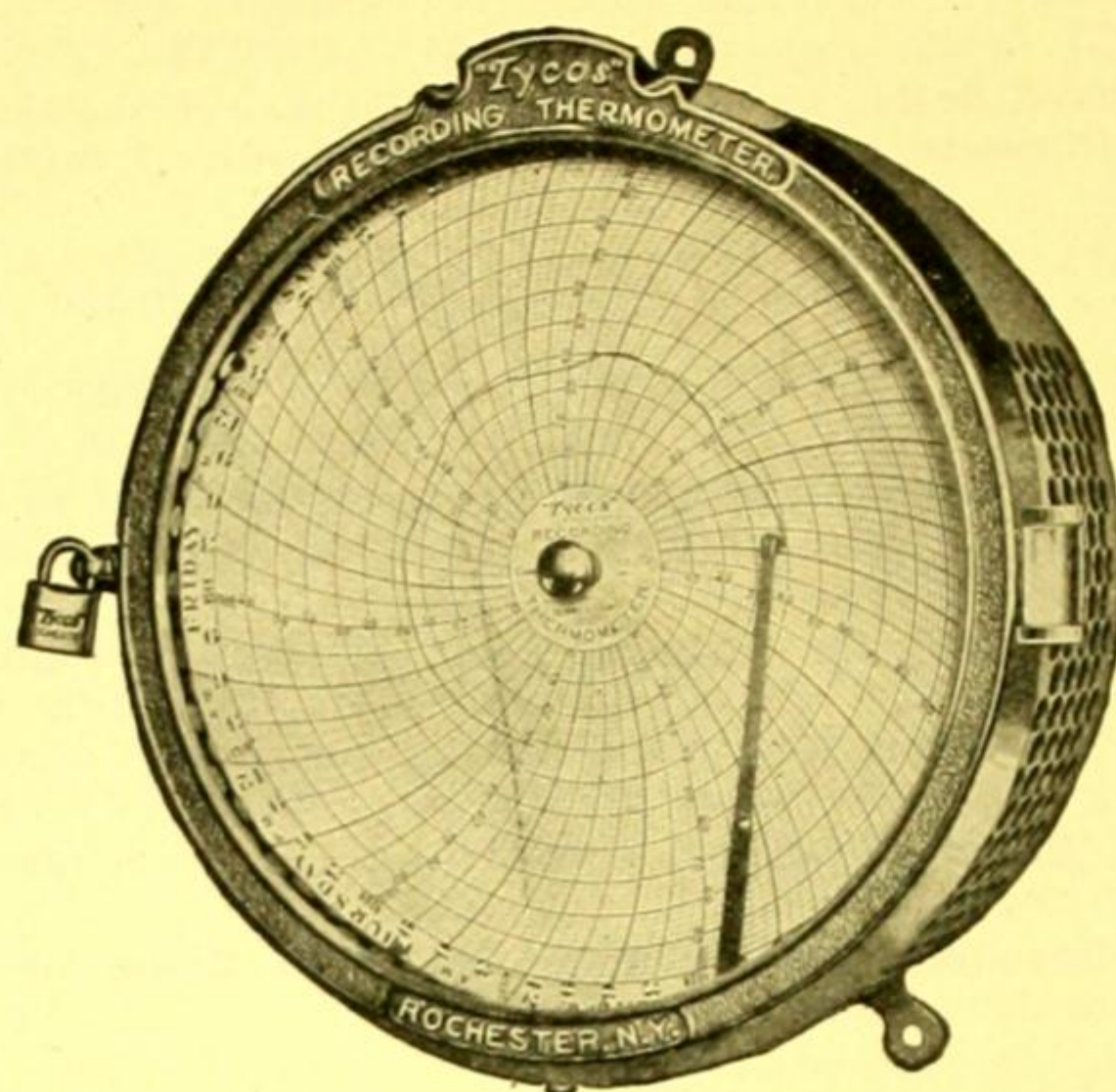
No. 13666.

No.	A	B	C	D
Range	-40° to 120° F.	30 to 230° F.	-20 to 60° C.	200 to 1000° F.
Size of subdivisions, degrees	2	5	1	10
Each	60.00	60.00	60.00	82.00

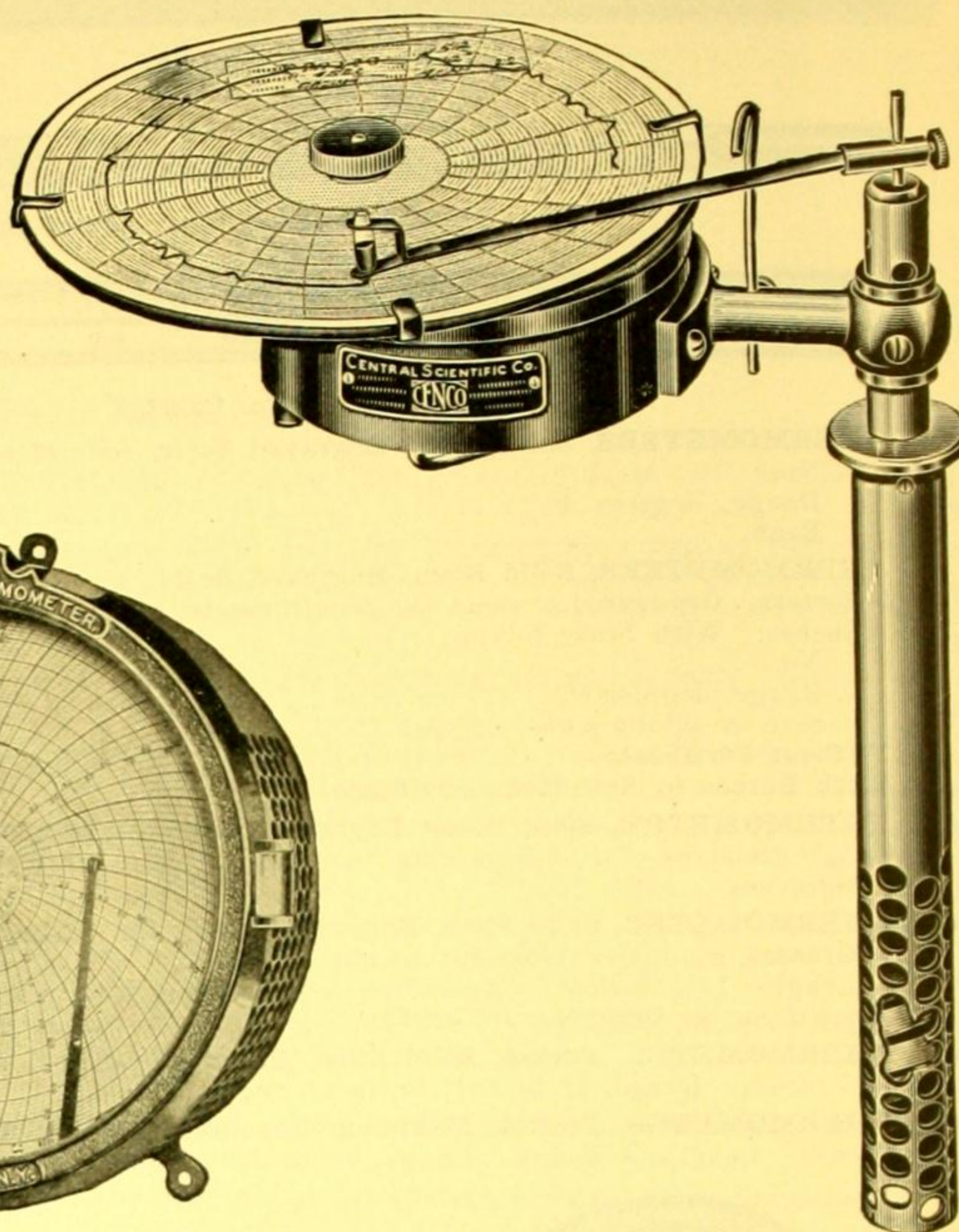
Note:—Thermometers of other ranges will be furnished on application; also for 24 hours instead of seven days.

THERMOMETERS, RECORDING

13666. **THERMOMETERS, Recording**, with clock movement for revolving the chart, and a steel coil spring for actuating the recording pen arm; a flexible connecting tube through which the action of the mercury in expanding or contracting is transmitted from the sensitive element (the bulb) to the coil spring; and a bulb or sensitive element which is inserted at the point whose temperature is to be determined. The spring, the steel connecting tube, and the bulb are welded together, forming a hermetically sealed mercury filled system. In black enameled iron case, with nickel-plated ring, complete with 100 charts divided for making one revolution in seven days, extremely sensitive bulb 18 inches long, 10 feet of flexible protected capillary tubing (in case a greater length of tubing is desired, state exact length in order and add 40 cents per foot for each foot over 10) and supply of ink and pens.



No. 13670.



No. 13672.

13667. Charts for No. 13666, 8 inches in diameter, for 7 day period.

No.	A	B	C	D
Per hundred	\$2.75	2.75	2.75	2.75

13670. **THERMOMETER, Recording, Self Contained**, for obtaining continuous weekly records of weather, room or incubator temperatures. The case is 12 inches in diameter, finished in weather-proof black, with polished bronze hinged front. Range, 0° to 130° F. in 2° divisions. Complete with lock and key, one hundred 7-day charts and bottle of special recorder ink.... 63.00

13671. Charts for No. 13670.....Per hundred 3.60

13672. **THERMAL RECORDER**. Although this instrument can be used as a recording thermometer with a range of approximately 40° C., it was originally designed to supply the need for a device which would make a record of variations in temperature from an intended constant value. The sensitive element is a helix of bimetallic strip (thermostatic metal) which winds and unwinds as the temperature changes. Its motion is communicated to a pen which may travel across one side of a circular chart, and which can be set at any point on the chart. The latter has forty concentric circular divisions each of which corresponds approximately to 1° C., with the fifth and tenth divisions heavier than the unit divisions. The chart is clamped on a circular disk which is rotated by clockwork once in twenty-four hours. The one hour intervals are shown on the chart. The recorder is so arranged that the sensitive element may be inserted in a constant temperature chamber such as an incubator or drying oven, or it may be mounted in the open air of a room, or outdoors. It responds quickly to temperature changes, and its sensitivity is such over the entire range that 1° C. causes a motion of the pen of approximately 1.6 mm. The maximum temperature at which the indications may be considered reliable is 260° C. When the instrument is used for recording very wide fluctuations in temperature the scale can be easily calibrated by referring to a mercury thermometer. Diameter of external sheath surrounding the helix, 22 mm. Complete with 100 charts. 35.00

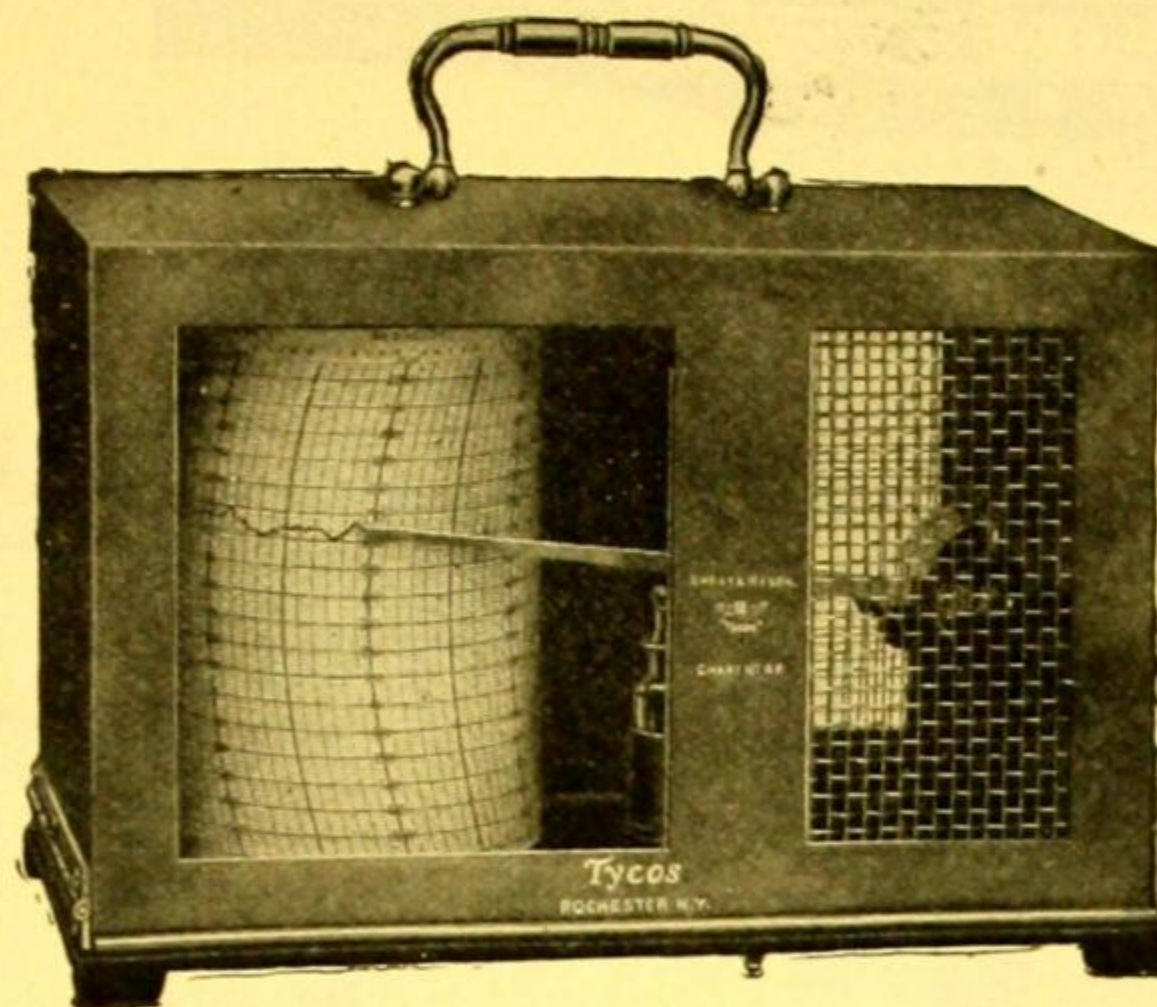
13674. Charts, for No. 13672.....Per package of 100 1.50



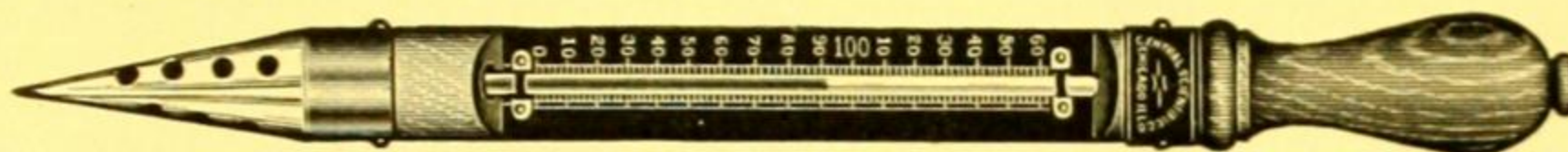
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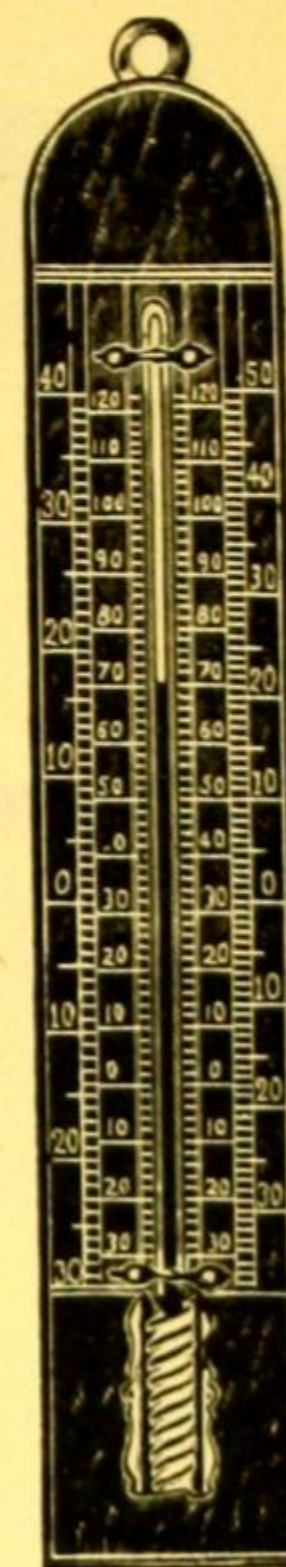
No. 13712.



No. 13676.



No. 13710.



No. 13716.

13676. **THERMOMETER, Recording (Thermograph).** Made in America. A most accurate thermometer which will not vary its standard for years. A complete record is given by a pen upon a printed chart for an entire week, and by its form the exact thermometric reading can be seen at any moment, as well as the varying line traced by the pen for the time preceding. The charts are changed at the beginning of each week and can be retained as a record for the entire year. Mechanism consists of a spiral lamina of non-rusting material, which is exposed to the atmosphere at the end of the case. It is extremely sensitive and, having no levers in its construction, is very rigid. In non-corrosive metal case with glass front and screened openings on three sides about the lamina, and with storage space for charts. Range, 0° to 100° F. in 2° divisions. May ordinarily be used for any range of 100° F. between -20° and +250° by means of No. 13683 Unfigured Charts. Complete with full directions for use, charts for one year, pen and ink..... \$50.00

13681. **Thermograph Charts, 0° to 100° F., for use with No. 13676.** In boxes containing a year's supply..... **Per box 3.50**

13683. **Thermograph Charts, Unfigured, for use with No. 13676.** Range, 100° F. in 2° divisions. In boxes containing a year's supply..... **Per box 3.50**

Note.—In ordering thermograph charts, to insure fit, it is necessary to send in a sample of the kind in use.

920. **Ink, purple, for thermographs.**..... **Per bottle .55**

13710. **THERMOMETER, Soil, Standard Grade, magnifying tube, mercury-filled, mounted on 15 inch turned mahogany frame with oxidized brass scale, and with pointed metal end.** Range, -30° to 180° F..... **2.00**

13712. **THERMOMETERS, Soil, as used by the New York Agricultural Experiment Station.** With solid stem engraved scale thermometer mounted in turned wood case with upper part cut away to expose 10 inches of the scale from about 20° to 120° F. Both ends are protected by metal ferrules.

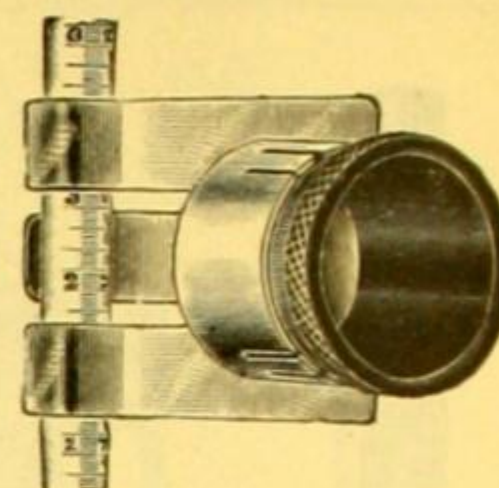
No.	A	B	C
For use at depth, inches.....	12	24	36
Each	11.00	13.00	15.00

13716. **THERMOMETER, Three Scale, boxwood, F., R. and C. scales.**..... **.60**

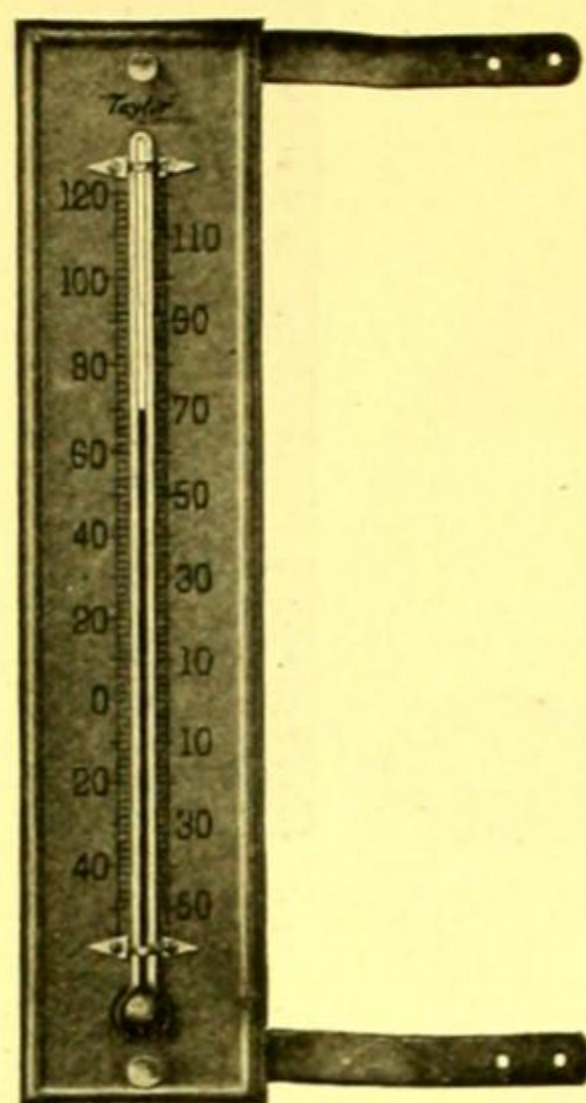
13718. **THERMOMETER, Turpentine Distillation, solid stem, engraved scale, graduated from 145° to 200° C. in 1/5° divisions. Scaled for total immersion. Length, about 6 inches. (According to American Society for Testing Materials Tentative Specifications for 1921, No. D13-21T)** **6.00**



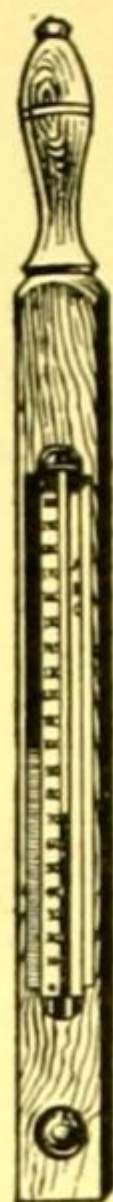
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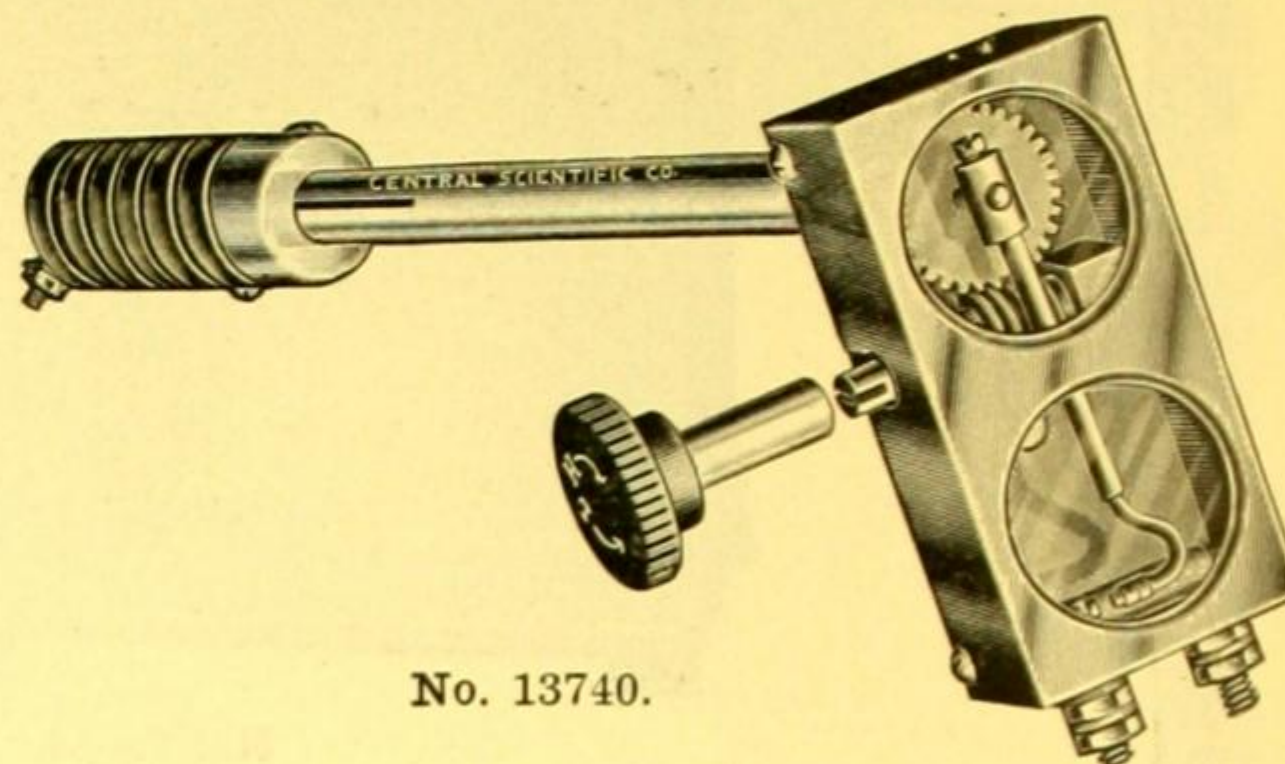
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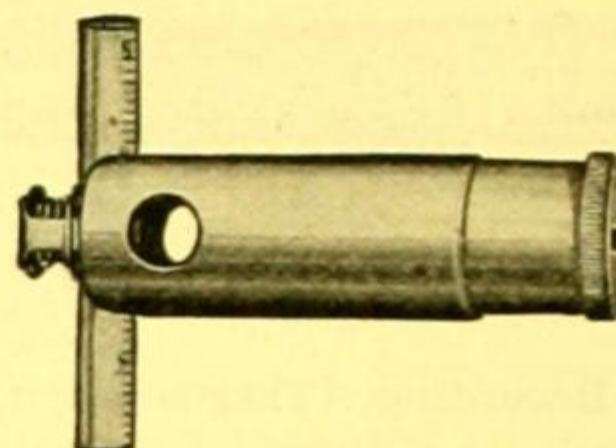
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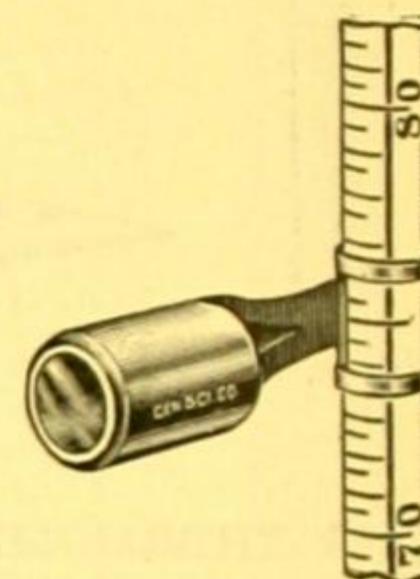
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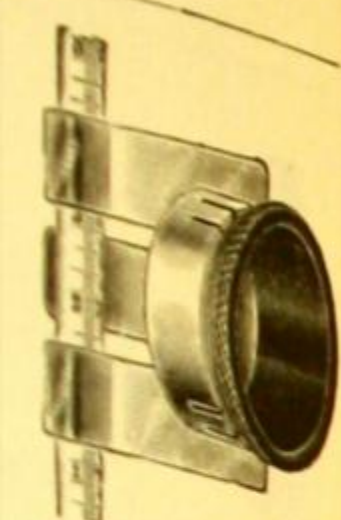


No. 13730.



No. 13733.

13720. **THERMOMETER, Weather Bureau Standard**, 12 inch, cylindrical bulb, graduation etched on tube. The tube is mounted on an aluminum scale on which is marked every 5 degree line of the scale, and the figures every 10 degrees. Has brass insulating support and binding screws. Approximate range, -30° to 120° F. With manufacturer's certificate..... \$7.00
13724. **THERMOMETER, Window**, for weather observations, with magnifying tube, alcohol filled, mounted on nickel-plated metal back, with brackets for attachment to window frame. Length, 10 inches; approximate range, -40° to 120° F..... 1.20
13728. **THERMOMETER, Wood Frame**. Floats horizontally in liquids. No metal to corrode. Length, 12 inches; range, about 10° to 140° F..... .70
13730. **THERMOMETER READING ATTACHMENT**, designed especially for use with Calorimeter Thermometers. Supported by the thermometer stem, thereby maintaining a constant angle of vision over the whole scale..... 2.25
1984. **THERMOMETER READING ATTACHMENT**, consisting of a nickel-plated brass clamp to fasten on the thermometer stem with an adjustable eyepiece 3.00
13733. **THERMOMETER READING ATTACHMENT**, simple form, supported by the thermometer stem. Diameter of lens, 7 mm. Can be attached to thermometer 5 to 8 mm diameter by bending the simple clip attachment..... .50
13740. **THERMO-REGULATOR, Electric, De Khotinsky Bimetallic**. The sensitive element of this regulator is a helix made from laminated metal strip consisting of a thin layer of brass intimately welded to a similar layer of invar-steel. It can be set at any desired temperature from that of the surrounding atmosphere to 200° C. A change of temperature of $\frac{1}{4}^{\circ}$ C. is sufficient to produce convenient opening and closing of the contacts. It can be used for most purposes without a relay since it will successfully break a current of 3 amperes. A condenser of approximately .03 microfarad capacity should be connected around the contact points whether the instrument is used for controlling alternating or direct current... 12.00



No. 1984.



No. 13733.

graduation etched on every 5 degree line of port and binding screws. \$7.00

ing tube, alcohol filled, window frame. Length, 1.20

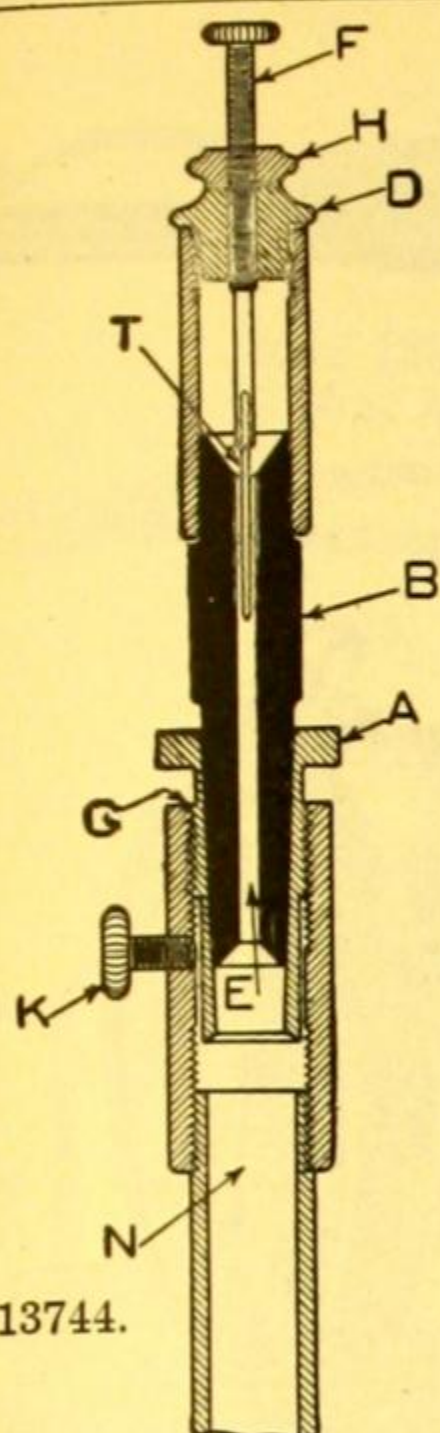
tal to corrode. Length, .70

e with Calorimeter Thermometer a constant angle of 2.25

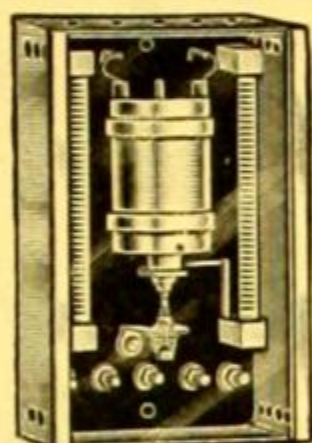
ed brass clamp to fasten 3.00

y the thermometer stem. diameter by bending the 50

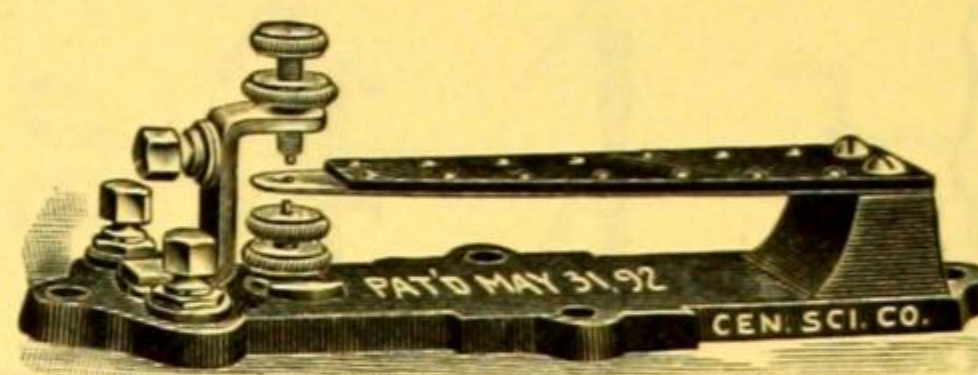
ve element of this regulator in layer of brass into any desired temperature of $\frac{1}{4}^{\circ}$ C. is It can be used for most of 3 amperes. A contact around the contact direct current... 12.00



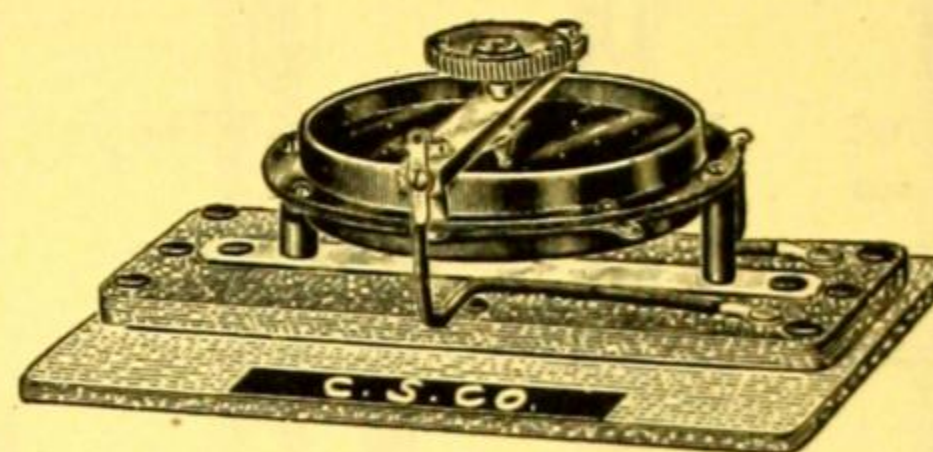
No. 13744.



No. 13748.



No. 13754.



No. 13756.

13744. THERMO-REGULATOR, Electric, De Khotinsky Standard. This thermo-regulator was developed for the control of water baths to the highest attainable precision. In considering the use of any regulator containing a thermostatic liquid such as toluol, alcohol, or mercury, it should be remembered that the precision of regulation, i. e. the uniformity of temperature throughout the bath as well as its constancy over extended periods of time, depends not upon the regulation alone but to a very large measure upon the effectiveness of stirring and the rapidity with which the heater imparts its heat energy to the bath fluid. For the best results the heat interchanges must take place with the utmost rapidity. With these ideas as a basis this regulator was designed. It consists of a thin walled steel tube protected on the outside by a special rust-proofing process. The thin steel wall conducts heat nearly 100 times as rapidly as a glass wall having sufficient mechanical strength to withstand the same pressures. By the use of mercury as the thermostatic fluid very much more rapid conduction of heat into the interior of the reservoir takes place than is possible when an organic liquid is used. Contact is made within a short section of glass capillary tubing by means of a platinum point, and the mercury level is easily adjustable to the desired regulating point by means of a simple screw adjustment. The construction of the regulating head is shown in the figure.

With any regulator of this particular design, it is necessary to use a sensitive relay, i. e. one which requires the smallest possible operating current. This is necessary in order to avoid the formation of an arc at the mercury surface each time the contact is broken. By avoiding the arc it is possible to operate the regulator for much longer intervals of time without cleaning the mercury than could otherwise be done. The construction of this regulator permits cleaning of the capillary tube without trouble when such cleaning becomes necessary.

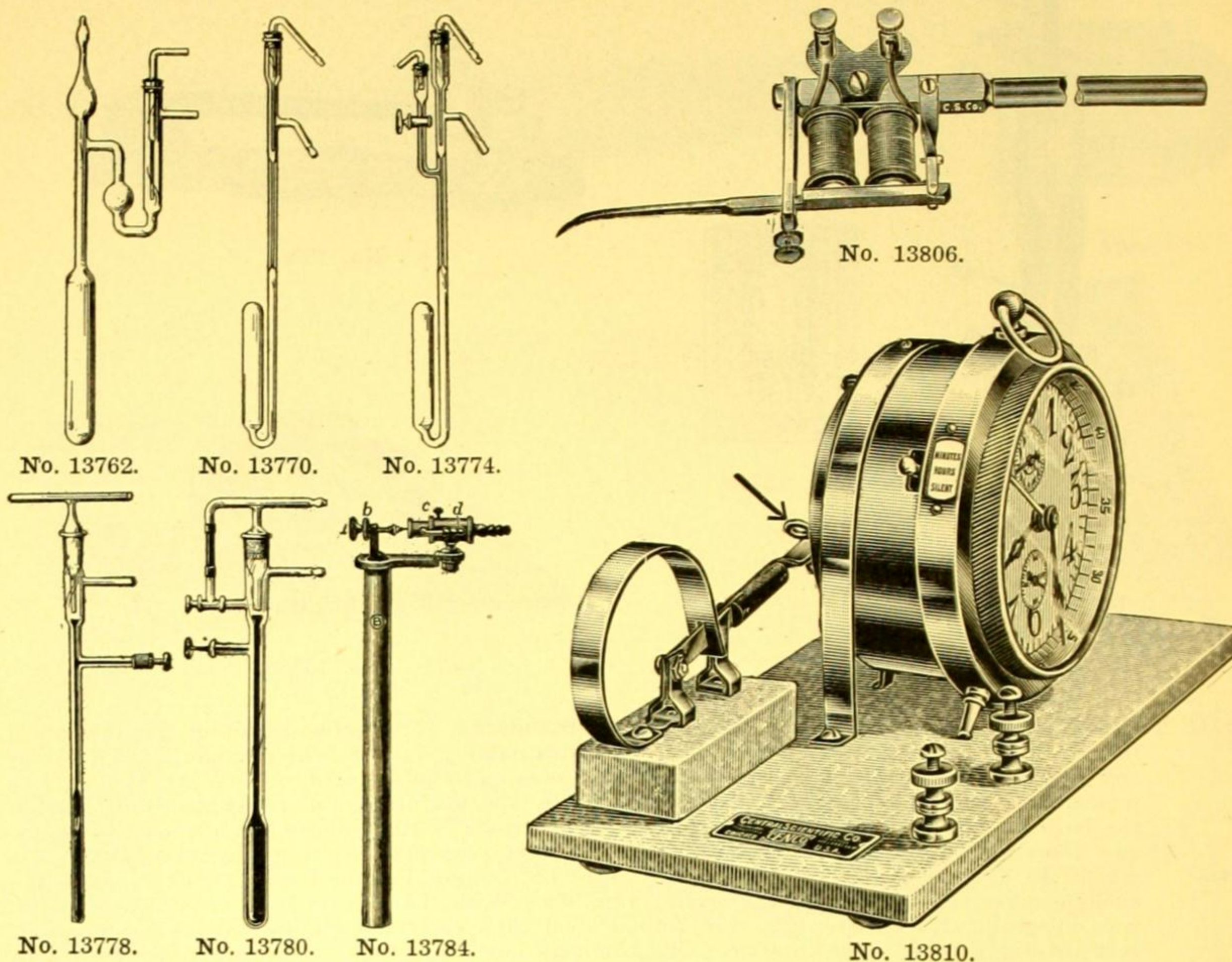
The particular design of the mercury reservoir such as length, diameter, number of tubes, and the particular type of relay required, depends so much upon the conditions that it is impossible to specify what should be used unless the conditions are known. Our scientific staff will be glad to advise any prospective user as to the proper combination of regulator and relay to be used for his particular conditions, and we shall be glad to quote prices upon equipment which in our opinion will meet the requirements.

The information which must be supplied us in order that we may advise regarding the proper equipment to select, comprises the following facts: (1) dimensions and material of bath; (2) bath liquid, oil or water; (3) depth of liquid; (4) precision of control desired; (5) temperature of control; (6) probable limits of variation of room temperature; (7) kind of heating units contemplated, including available voltage and kind of current; (8) provision for water cooling; (9) provision for stirring; (10) intended uses.

13748. RELAY, DeKhotinsky Iron Clad, for use with No. 13744 for accurate temperature regulation. This must be ordered in connection with No. 13744, and the same information must be furnished. When ordered, complete directions will be furnished including a wiring diagram showing all connections to be made. Price dependent upon conditions to be met.

13754. THERMO-REGULATOR, Electric, simple form, consisting of a strip of hard rubber and metal riveted together, the difference in their expansion causing the strip to bend, thus opening or closing an electric circuit through the platinum contact points. Useful as a fire alarm, and in roughly controlling the temperature in hot-houses, incubators and other places where a constant temperature is essential. \$2.70

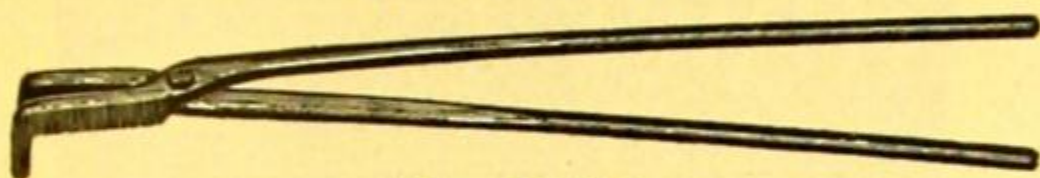
13756. THERMO-REGULATOR, Electric, with condenser, for use in incubators. Will control temperatures automatically to $\frac{1}{2}^{\circ}$ C., through a range from 30° C. to 60° C. Very simple in construction and constant in operation. For full description, see No. 7908. 13.00



13762. **THERMO-REGULATOR**, Gas, Dunham's, of glass, for regulation of gas flame. Without mercury \$2.30
13770. **THERMO-REGULATOR**, Gas, Mercury-Toluene type, of glass. Length, about 12 inches.. 2.00
13774. **THERMO-REGULATOR**, Gas, same as No. 13770, but with reservoir and glass stop-cock to vary the amount of mercury..... 5.50
13778. **THERMO-REGULATOR**, Gas, Reichert's, of glass with brass adjusting screw. Length 9½ inches 2.75
13780. **THERMO-REGULATOR**, Gas, Reichert's improved, with stop-cock to prevent extinguishing the flame 6.00
13784. **THERMO-REGULATOR**, Gas, Roux Bimetallic, operating without the use of mercury or glass. Diameter of tube, 1 inch. Length, 10 inches..... 12.00
- THERMOS BOTTLES**, see Vacuum Bottles.
- THERMOSTATS**, see Physical Chemistry Apparatus.
- THISTLE TUBES**, see Funnel Tubes.
13792. **THREAD**, Cotton, White, No. 70, in spools of 150 yards Per spool .12
Per dozen 1.20
13794. **THREAD**, Linen, Black, No. 30, in spools of 200 yards Per spool .55
Per dozen 5.50
13796. **THREAD**, Silk, Black, No. A, in spools of 50 yards Per spool .16
Per dozen 1.60
13800. **THUMB TACKS**, stamped steel, made of one piece, head ⅝ inch..... Per dozen .09
Per gross .75
13806. **TIME MARKER**, Electrically Operated, with aluminum stylus, for use in connection with No. F783 Metronome (or other periodic circuit breaker) and a Kymograph (see No. F6065). Mounted on a 10 mm rod 22 cm long, for clamping to any support. Small and compact; positive in action 9.00
13810. **TIME SWITCH** for automatically disconnecting electrically operated instruments or appliances from the circuit at the expiration of a given interval of time. Consists of a single pole knife switch operated by an interval time clock which may be set to throw the switch at the end of any interval of time from ¼ minute up to 12 hours. Complete as illustrated, mounted on transite base with binding posts 20.00
- TIN BOXES**, see Boxes.

Nos. 13824-32 and
Nos. 13840-42.

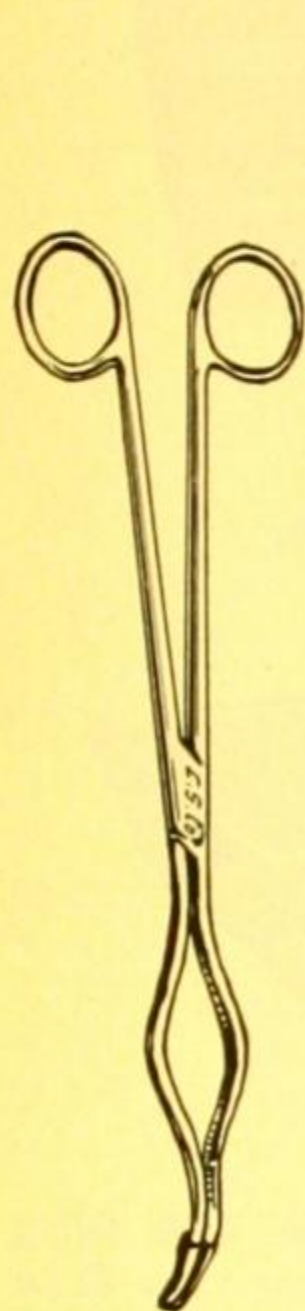
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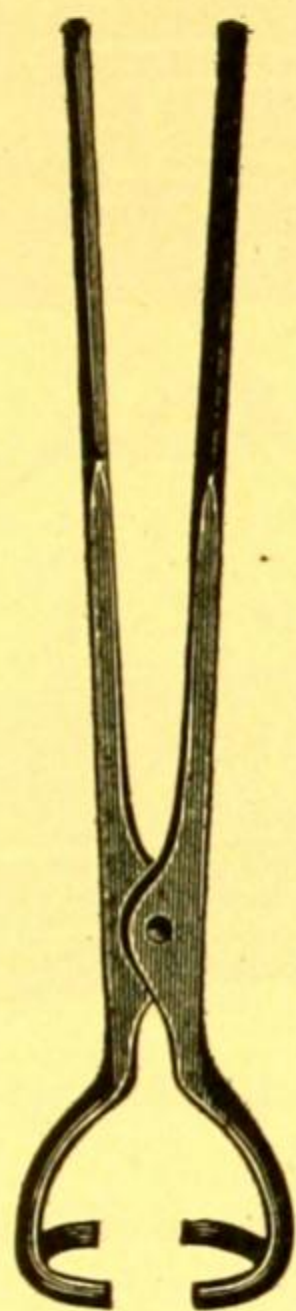
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No. 13864.



No. 13851.



No. 13866.



No. 13870.



No. 6020.



No. 13876.

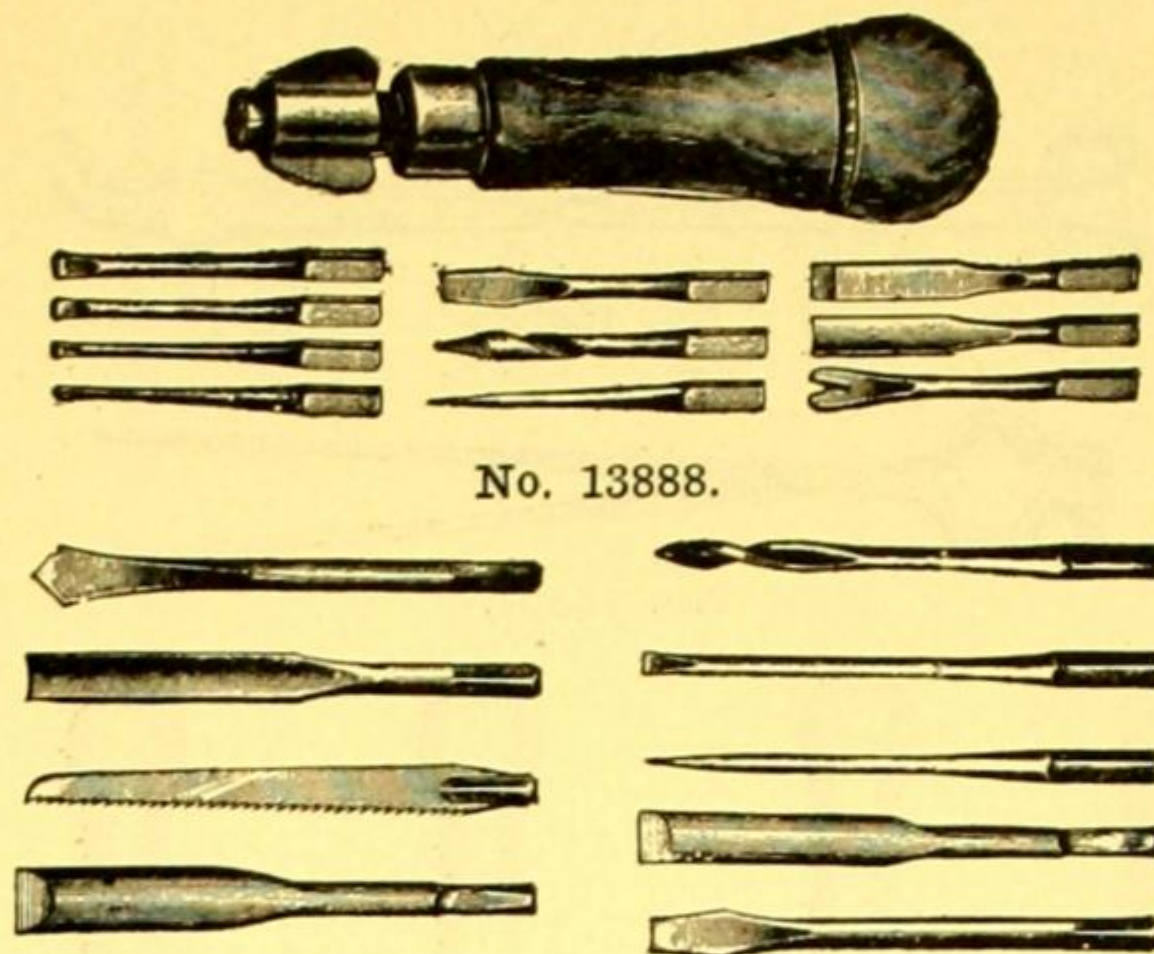


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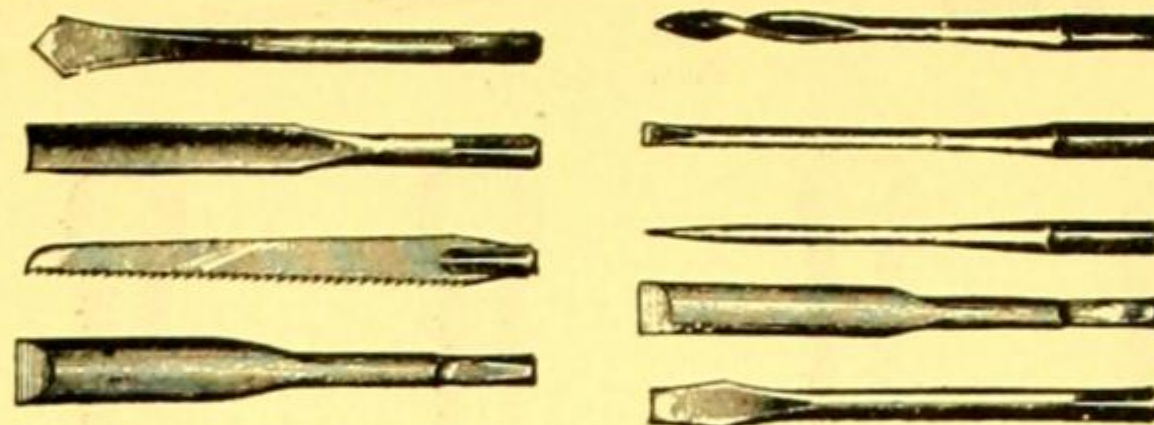


No. 13882.

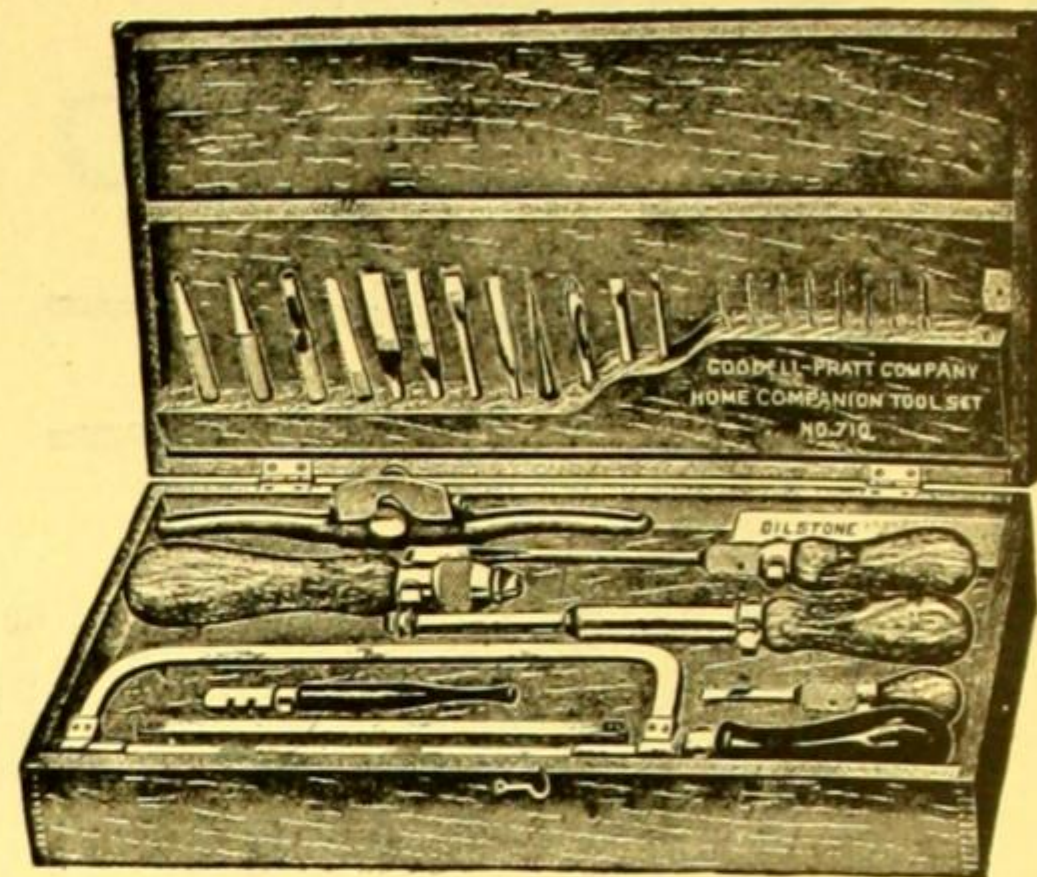
13824. **TONGS**, Crucible, Double Bent, brass, with riveted joint. Length, 9 inches. \$0.25
13826. **TONGS**, Crucible, Double Bent, brass, nickel-plated, with riveted joint. Length, 9 inches45
13830. **TONGS**, Crucible, Double Bent, steel, protected against corrosion by the new Parker rust-proof finish, with riveted joint. Length, 9 inches.20
13832. **TONGS**, Crucible, Double Bent, steel, nickel-plated, with riveted joint. Length, 9 inches.40
13836. **TONGS**, Crucible, Double Bent, forged steel, nickel-plated, with lock joint. Length, 10 inches. With corrugated tips 1.50
13840. **TONGS**, Crucible, Double Bent, solid nickel, with riveted joint. Length, 9 inches.90
13842. **TONGS**, Crucible, Double Bent, solid chromel, suitable for handling hot platinum ware. With riveted joint 3.00
13851. **TONGS**, Crucible, Double Bent, solid nickel, with hollow platinum shoes, lock joint. Length, 8 inches. Price varies with market price of platinum.
13858. **TONGS**, Crucible, Double Bent, steel, nickel-plated, with riveted joint. For use in handling crucibles and dishes in muffle furnaces. Length, 18 inches 2.00
13862. **TONGS**, Crucible, Single Bent, malleable iron, for heavy crucibles. Length, 12 inches. 1.10
13864. **TONGS**, Crucible, Double Bent, wrought iron, for heavy crucibles. Length, 30 inches. 2.50
13866. **TONGS**, Crucible, Double Bent, wrought iron, for lifting heavy crucibles vertically. Length, 33 inches. For crucibles up to 4 inches. 3.00
13870. **TONGS**, Crucible, Julian's, steel, nickel-plated, for handling crucibles in a muffle furnace. Length, 20 inches 2.80
6020. **TONGS**, Cylinder or Crucible, with curved jaws. Designed especially for use with No. 5906 Baking Cylinder. Length, 24 inches. 2.00
13876. **TONGS**, Cupel, steel, with bent flat ends. Length, 30 inches 1.50
13878. **TONGS**, Cupel, steel, with curved ends. Length, 30 inches 2.00
- TONGS**, Gas, see Pliers. 2.00
13882. **TONGS**, Scorifier, spring steel, light. Length, 30 inches 2.00



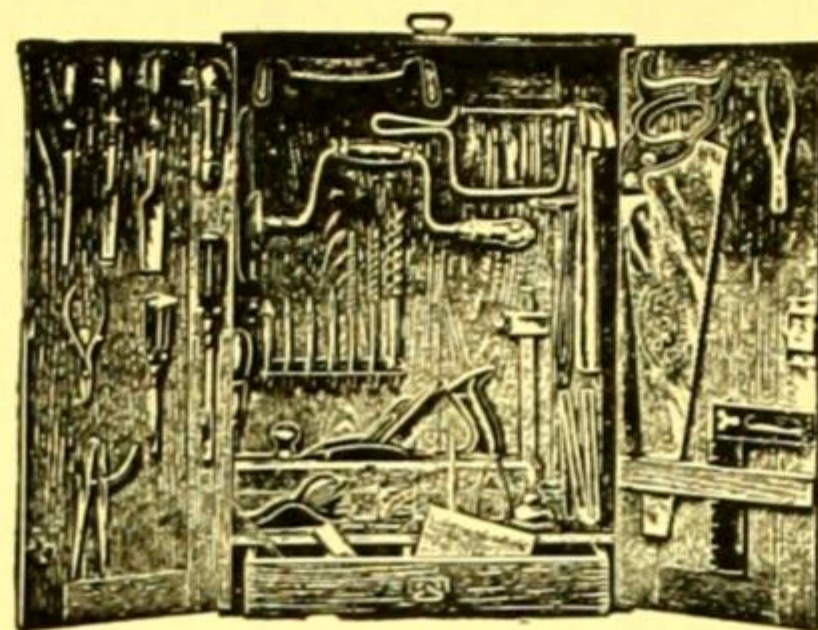
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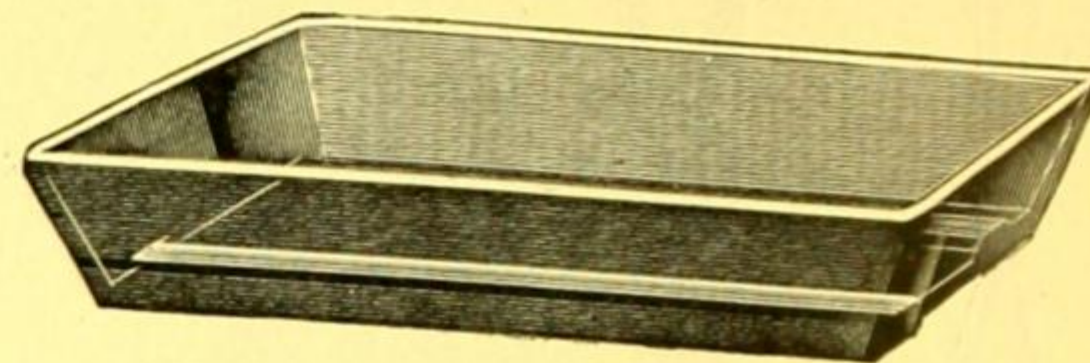
No. 13890 (Tools only).



No. 13894.

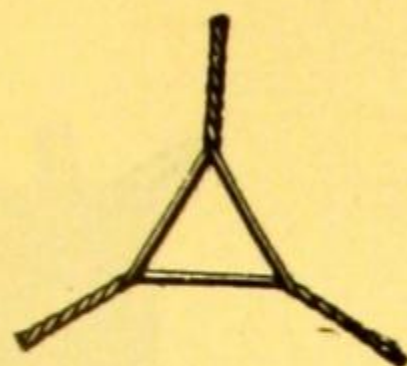


No. 13900.

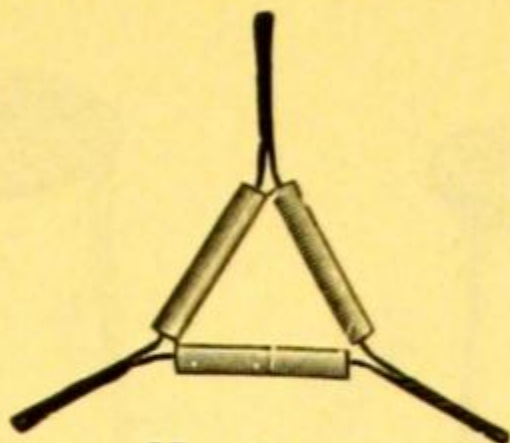


No. 13914.

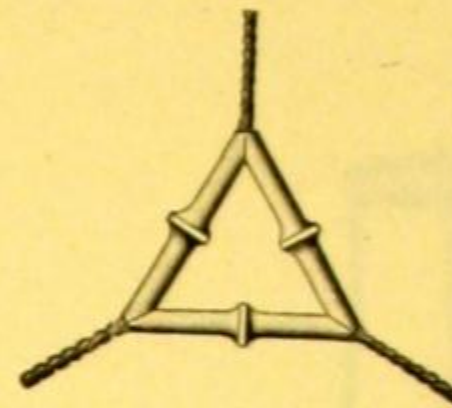
13888. **TOOL HOLDER**, with hollow wood handle and ten enclosed tools. Length of holder over all, 6 inches. Length of tools, 2½ inches. \$1.00
13890. **TOOL HOLDER**. Handle similar to that of No. 13888, but larger and better finished. Has 9 tools, as shown in the illustration. Length of handle over all, 7 inches. Length of tools, 3¾ inches 3.50
13894. **TOOL SET** in Case of polished hardwood, 16x8½x3½ inches, containing 6-in. and 1½-in. ratchet screw drivers, hand shave, hack saw frame with 11 blades and one bone saw, glass cutter, wood handle automatic drill, tool handle with 9 tools, nail set, prick punch, saddlers' drive punch, solid punch, and oil stone. 15.00
13900. **TOOL SET** in Chest of chestnut, panelled and nicely finished. Contains the following high grade tools:
 Panel saw, brace, 3 gimlet bits, 3 auger bits, 3 chisels, 2 screw drivers, hack saw frame, pocket level, countersink, scraper, hammer, tack hammer, tool handle with 10 tools, spoke shave, block plane, jack plane, 2-foot rule, try square, marking gage, nail sets, wing dividers, gas pliers, flat nose pliers, nippers, saw file, oil stone, oil can, can of glue, and coping saw. Weight, 55 lbs. 38.00
- TOOLS**, Miscellaneous, see various headings, as Calipers, Pliers, Hammers, etc.
13906. **TOWELLING**, Crash, good quality, 16 to 17 inches wide, in bolts of 50 yards. . . . Per yard .30
 Per bolt 12.50
- TRANSITE**, see Asbestos Slate.
- TRANSITS**, see Surveying Instruments.
- TRAYS**, Germinating, see Grain Testing Apparatus.
13914. **TRAYS**, Glass, Photographic, of clear flint glass.
- | No. | A | B | C |
|------------------------|-------|-------|--------|
| Size, inches | 4½x5½ | 5½x8½ | 8½x10½ |
| Each | .30 | .40 | .90 |
- TRAYS**, Slide, see Microscope Accessories.
- TRAYS** for Soil Analysis Work, see Soil Analysis Apparatus.



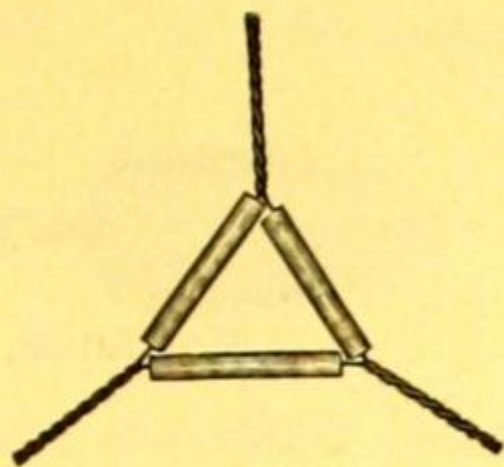
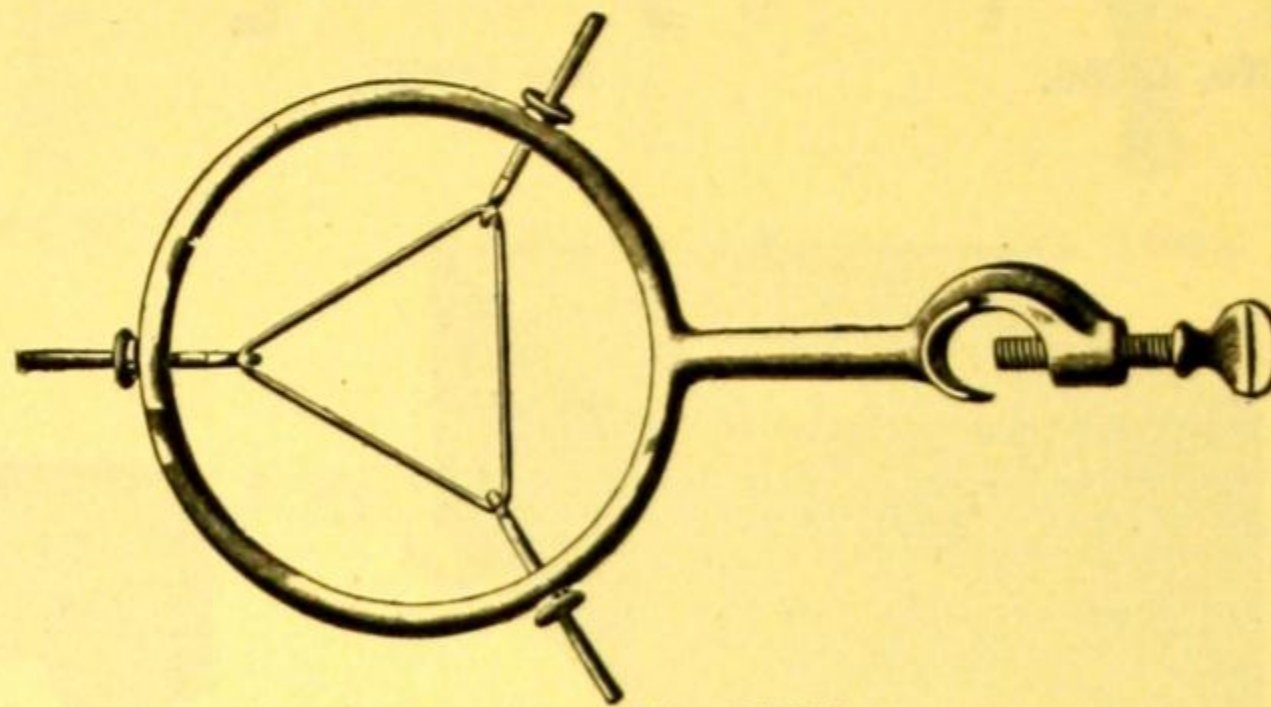
No. 13932.



No. 13934.



No. 13936.

No. 13942.
(Chromel-Silica.)

No. 13950.

TRIANGLES, Draftsman's, see Drawing Instruments.

TRIANGLES, Glass Dessicator, see No. 3804.

13932. TRIANGLES, iron wire, twisted

No.	A	B	C
Length of side, inches.....	1½	2	2½
Each	\$0.05	.05	.05
Per dozen	.40	.40	.40

20% discount from the dozen price in lots of 144.

13934. TRIANGLES, iron wire covered with pipe stems.

No.	A	B	C
Length of side, inside, inches.....	1½	2	2½
Each	.09	.09	.12
Per dozen	.70	.70	.95

20% discount from the dozen price in lots of 144.

13936. TRIANGLES, iron wire covered with pipe stems having raised centers, so that the crucible rests on these points.

No.	A	B	C
Length of side, inside, inches.....	2	2½	3½
Each	.13	.14	.15
Per dozen	1.35	1.40	1.45

20% discount from the dozen price in lots of 144.

13940. TRIANGLES, Chromel wire, melting point about 3000° F., non-corrosive, costing but one-sixteenth as much as platinum and lasting longer in service.

No.	A	B	C
Length of side, inside, inches.....	1½	2	2½
Each	.15	.15	.19

13942. TRIANGLES, Chromel wire, covered with fused silica tubes, superior to any triangles yet produced.

No.	A	B	C
Length of side, inside, inches.....	1½	2	2½
Each	.50	.50	.70

13944. TRIANGLES, Hoskins' Chromel, made of heavy square-section wire, free from iron, and highly resistant to acids, oxidation, and fusion.

No.	A	B	C
Length of side, inside, inches.....	1½	2	2½
Each	.24	.24	.30

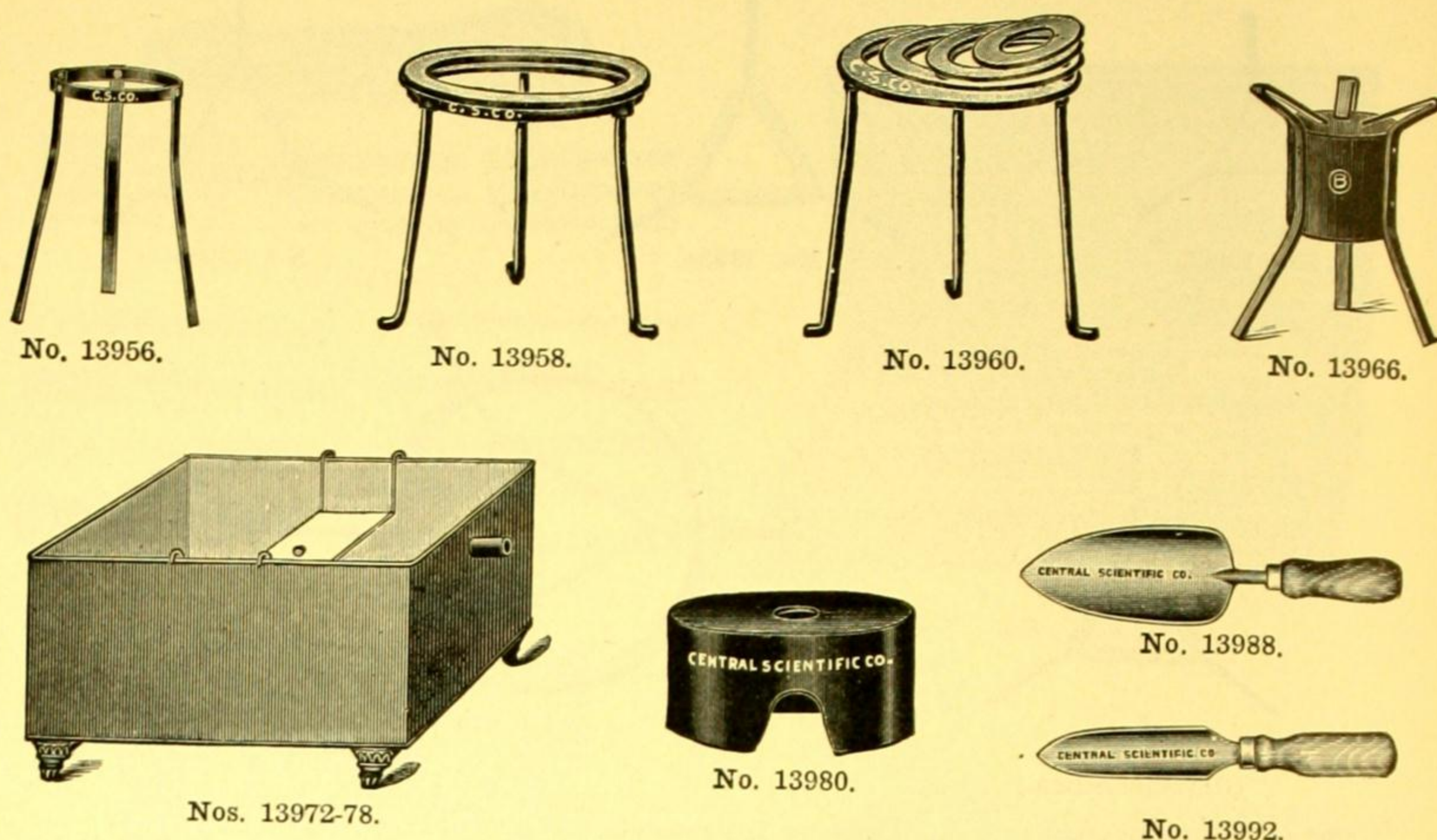
TRIANGLES, Platinum, see Platinum Ware.

13950. TRIANGLE HOLDER, adjustable, with clamp for attaching to support. Can be used with platinum, chromel or iron wire triangles, or by winding wire of any kind over the hooks, triangles with length of side any size up to 2¼ inches may be formed.

1.00

TRIPODS

CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.

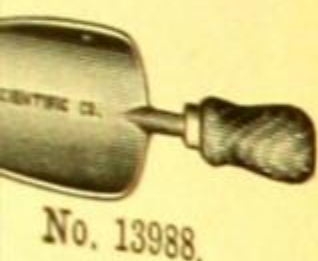


TRIPODS

13956. **TRIPOD**, iron, small, for alcohol lamps. Height, 6 inches; diameter, $3\frac{1}{4}$ inches. \$0.30
13958. **TRIPODS**, iron, japanned, with easily removable legs and wide rim. Height, 9 inches.
Diameter, outside, inches. 5 6 8
Each40 .50 .65 .80
10% discount in lots of 12, 20% discount in lots of 72.
13960. **TRIPODS**, iron, japanned, same as No. 13958, with concentric rings.
No. A B C D
Diameter, outside, inches. 5 6 8 10
Number of rings. 2 3 4 5
Each50 .65 .95 1.25
10% discount in lots of 12, 20% discount in lots of 72.
13961. **Rings** only of No. 13960.
No. A B C D
Diameter, inches 3 5 6 8
Each12 .17 .30 .45
10% discount in lots of 12, 20% discount in lots of 72.
13966. **TRIPODS**, iron, with sheet iron chimney, for protecting burner flame from drafts. Height over all, 9 inches.
Diameter, inches $3\frac{1}{2}$ 5
Each 1.50 1.80
13972. **TROUGH**, Pneumatic, of japanned tin with sliding shelf and overflow; students' size, $4\frac{1}{2} \times 6\frac{1}{2} \times 10$ inches65
13978. **TROUGH**, Pneumatic, heavy galvanized iron with sliding shelf and overflow, $5 \times 9 \times 12$ inches. 1.00
13980. **SUPPORT**, Beehive, for use with Nos. 13972 to 13978, for supporting the inverted receptacle in collecting gases; of zinc, 3 inches in diameter55
13988. **TROWEL**, 6 inch cold rolled steel blade, with malleable iron shank firmly riveted on and wood handle20
13992. **TROWEL**, Transplanting or Collecting, with narrow and deeply curved blade 6 inches long, and wood handle. Useful with the collecting case or as a transplanter, dibber, or weed digger25
- T SQUARE**, see Drawing Instruments.



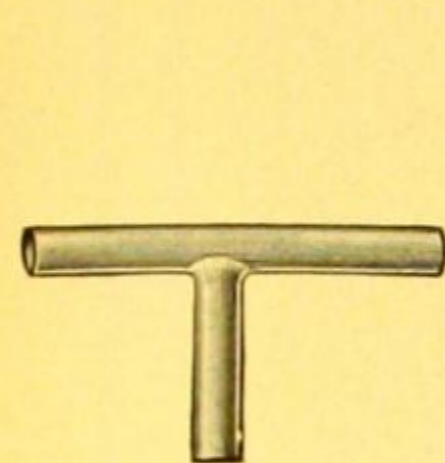
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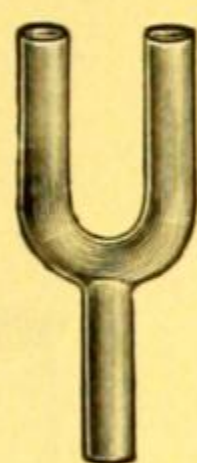
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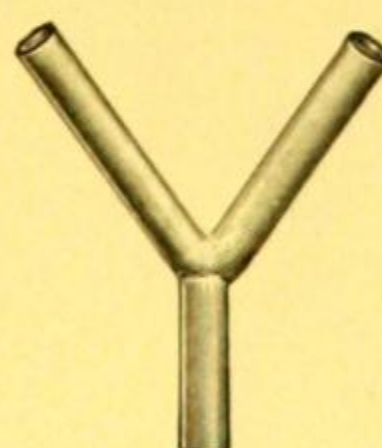
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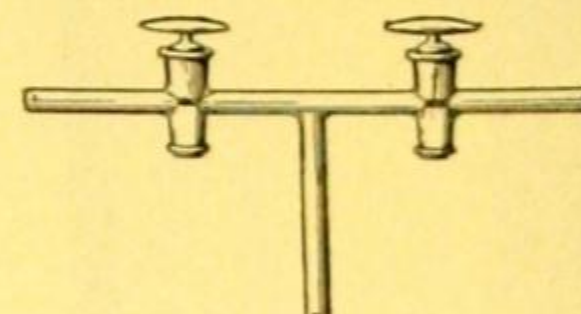
No. 14006.



No. 14008.



No. 14010.



No. 14012.



No. 14022.

TUBES, ALL KINDS

TUBES, Absorption, see Absorption Tubes.

TUBE, Air Thermometer, see Air Thermometer Tubes.

TUBES, Arsenic, see Arsenic Tubes.

TUBES, Calcium Chloride, see Calcium Chloride Tubes.

TUBES, Centrifuge, see Centrifuge Accessories.

TUBES, Color, see Colorimetric Apparatus.

TUBES, Combustion, see Combustion Tubes.

TUBES, Connecting, Brass. Approximate length of arms, 1 3/4 inches.

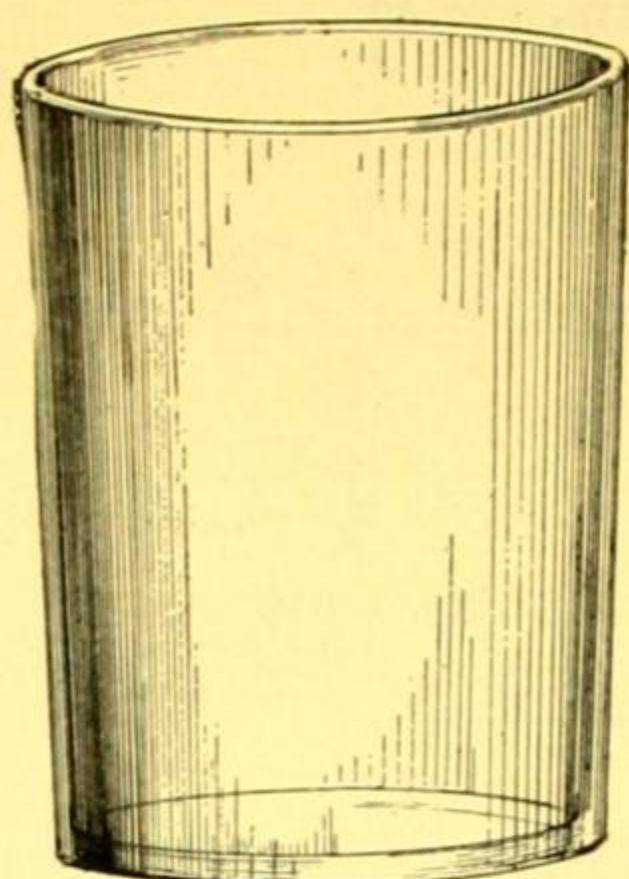
No.	A	B
Diameter, outside, inches.....	5/16	3/8
Diameter, inside, approx., inches.....	3/16	5/16
14000. TUBES, T shape	\$0.35	.35
14002. TUBES, Y shape	.35	.35

TUBES, Connecting, Glass.

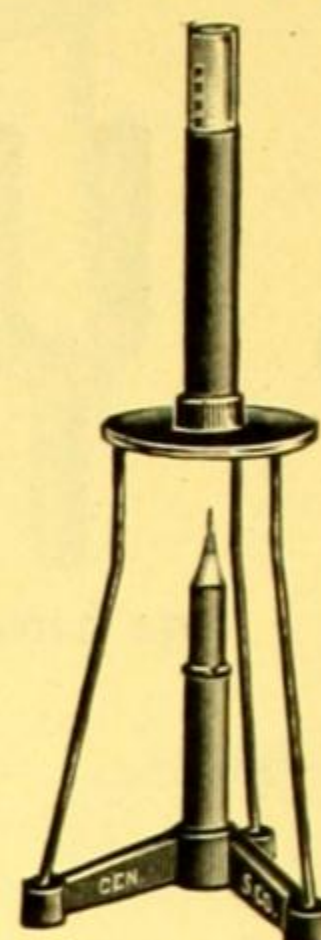
No.	A	B	C	D
Diameter, outside, mm.....	5	7	8	10
Diameter, inside, mm.....	3	5	6	8
Approx. length of arms, mm.....	50	50	60	75
14006. TUBES, T shape.....	.10	.10	.12	.14
14008. TUBES, U shape.....	.10	.10	.12	.14
14010. TUBES, Y shape.....	.10	.10	.12	.14

10% discount in lots of 12 from list prices of Nos. 14006-10.

14016. TUBE, Connecting, Lead, Y shape. Diameter outside, 8 mm; inside, 5 mm. Length of arms, about 1 1/2 inches.....	.40
14020. TUBE, Connecting, Hard Rubber, Y shape. Diameter outside, 8 mm; inside, 5 mm. Length of arms, about 1 inch.....	.20
14022. TUBE, Connecting, Reducer, Brass, for connecting 7/16 inch to 9/32 inch tubing. Without threads.	.25



No. F3355.



No. 14030.

TUBES, Culture, see Test Tubes.
 TUBES, Drying, see Calcium Chloride Tubes.
 TUBES, Fermentation, see Fermentation Tubes.
 TUBES, Filtering, see Filter Tubes.
 TUBES, Fractional Distillation, see Distilling Tubes.
 TUBES, Fused Silica, see Combustion Tubes.
 TUBES, Geissler, see Catalog F of Physical Apparatus.
 TUBES, Melting Point, see Melting Point Tubes.
 TUBES, Phosphorus, see Centrifuge Accessories.
 TUBES, Potato Culture, see Test Tubes.
 TUBES, Pyrometer, see Pyrometer Protection Tubes.
 TUBES, Quartz, see Combustion Tubes.
 TUBES, Soil Sampling, see Soil Analysis Apparatus.
 TUBES, Specimen, see Test Tubes.
 TUBES, Test, see Test Tubes.
 TUBES, Vacuum or Dewar, see Vacuum Tubes.
 TUBES, Water Analysis Color, see Color Tubes.
 TUBES, X Ray, demonstration form, see Catalog F of Physical Apparatus.
 TUBING, Flexible Metallic, see Rubber Tubing.
 TUBING, Rubber, see Rubber Tubing.
 TUBING, Silica, see Silica Tubing.
 TUMBLERS, Glass, with lip, see Beakers.

F3355. TUMBLERS, Glass, Heavy, capacity, about 250 cc; diameter at top, 60 to 65 mm...each \$0.07
 per dozen .65

TUMBLERS, Jelly, see Jars.

14030. TURBIDIMETER, Jackson's, for determining sulphates in water; consisting of a graduated tube 22 cm long, with metal case to exclude the light, and a support for tube and candleeach 14.00

F6665. Candles for use with No. 14030.....each .30

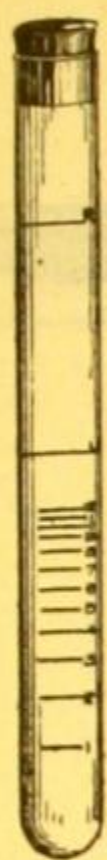
14032. Graduated Tubes, extra, for No. 14030.

No.	A	B
Length, cm	22	75
Each	3.75	7.25

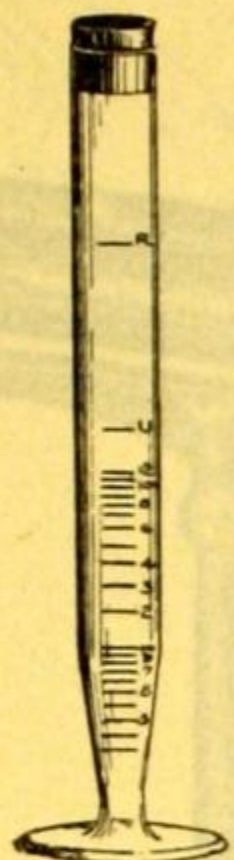
TWINE, Asbestos, see No. 312.

14038. TWINE, Cotton, 3-plyPer ball .15

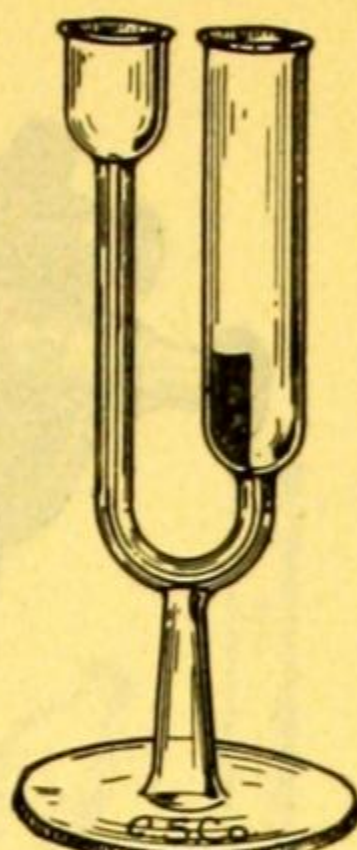
14040. TWINE, Linen, No. 9, white.....Per ball .50



No. 14060.



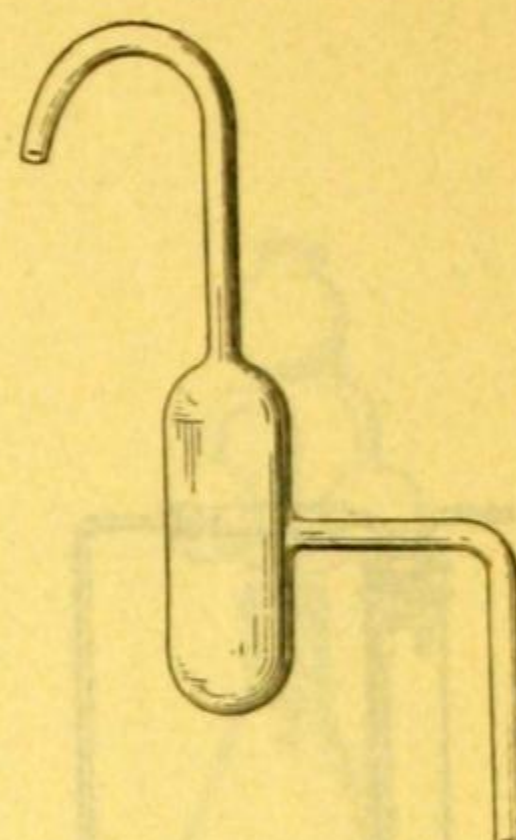
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No. 14064.



No. 14070.



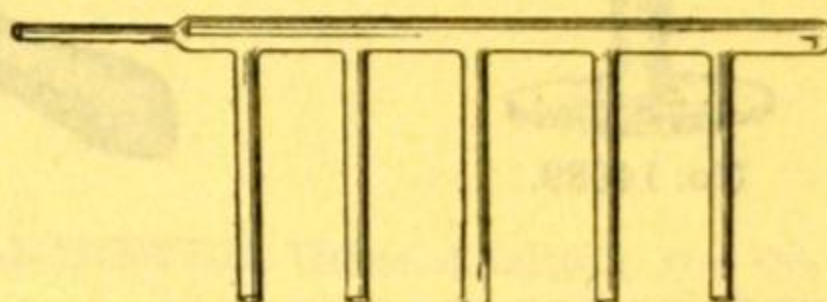
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No. 14072.



No. 14074.



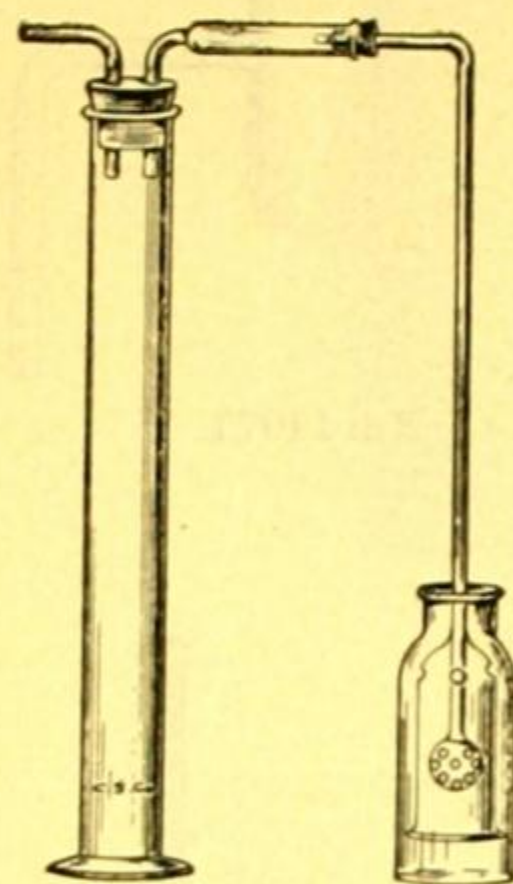
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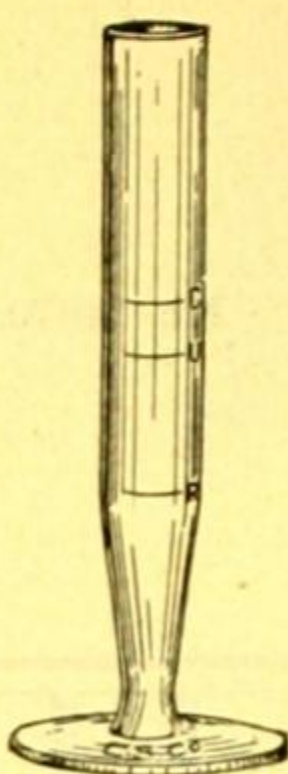
No. 10502.

URINE ANALYSIS APPARATUS

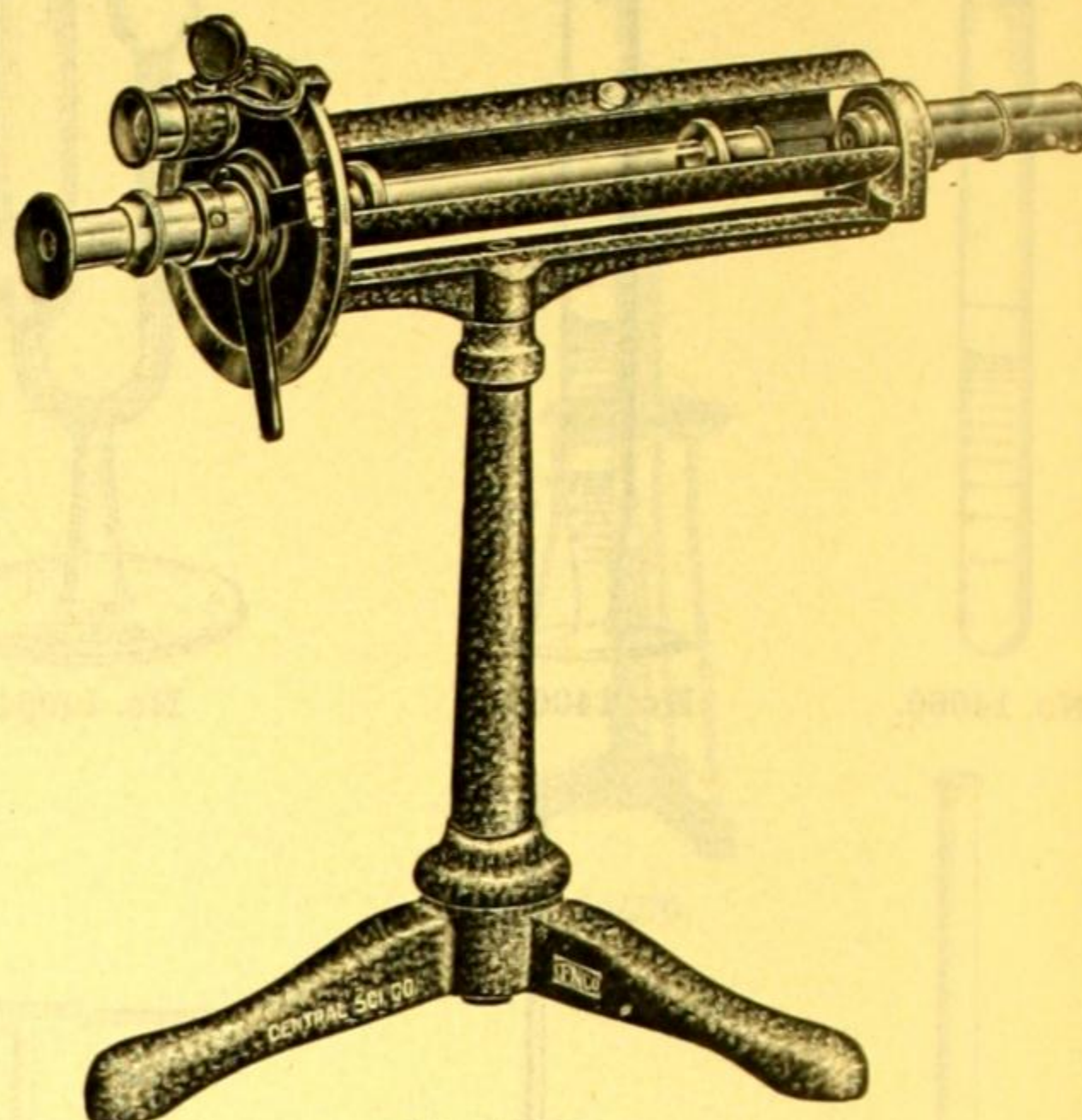
14060. **ALBUMINOMETER**, Esbach's, for the quantitative determination of albumin in urine with Esbach's reagent. Consists of a graduated tube with rubber stopper, which, when filled to the mark U with urine and the mark R with reagent, reads directly in grams of albumin per liter of urine. Complete with directions..... \$0.40
14062. **ALBUMINOMETER**, Esbach's, similar to No. 14060, but with pointed bottom for more accurate readings on small amounts of albumin, and with glass foot. Complete with directions 1.00
14064. **ALBUMOSCOPE (Horismascope)** for the detection of small quantities of albumin in urine. The reagent is added through the smaller side arm and comes in contact with the urine in the bottom of the larger arm in the proper manner to form a distinct ring. The lower portion of the larger tube is provided with a black background against which the cloudy white albumin ring is more clearly visible, thus rendering the test much more delicate than ordinarily, 1/60 per cent. of albumin being detectible. Complete with directions..... 1.10
14066. **FEHLING'S SOLUTION**, tablet form for use in Urine Analysis, consists of 25 tablets each of chemicals for solutions A and B, each tablet being sufficient to make one ounce of solution. Per box of 50 tablets..... .85
- Apparatus for the determination of Ammonia, Total Nitrogen and Urea in Blood and Urine by the Methods of Folin.**
(See Journal of Biological Chemistry, Vol. XI, No. 5, for June 1912.)
14070. **AMMONIA ABSORPTION TUBE**, small, with perforated end, 265x8 mm..... .30
14071. **AMMONIA TRAP**, Glass..... .65
14072. **CONDENSER TUBE**, for urea, 250x15 mm..... .20
14074. **FUME ABSORPTION TUBE**, straight, for bending to desired shape in the laboratory.. .70
14075. **CONNECTING TUBE or Manifold** for use with No. 14074 Absorption Tubes.
- | | A | B | C |
|---------------------|------|------|------|
| No. | 4 | 5 | 6 |
| Number of arms..... | 1.10 | 1.30 | 1.50 |
| Each | | | |
10502. **OSTWALD PIPETTES**, graduated to deliver exact amount at 20° C. Capacity, cc 1 2
Each55 .58
- 13365D. **TEST TUPES**, Pyrex glass, 200x25 mm.....each .25



No. 156.

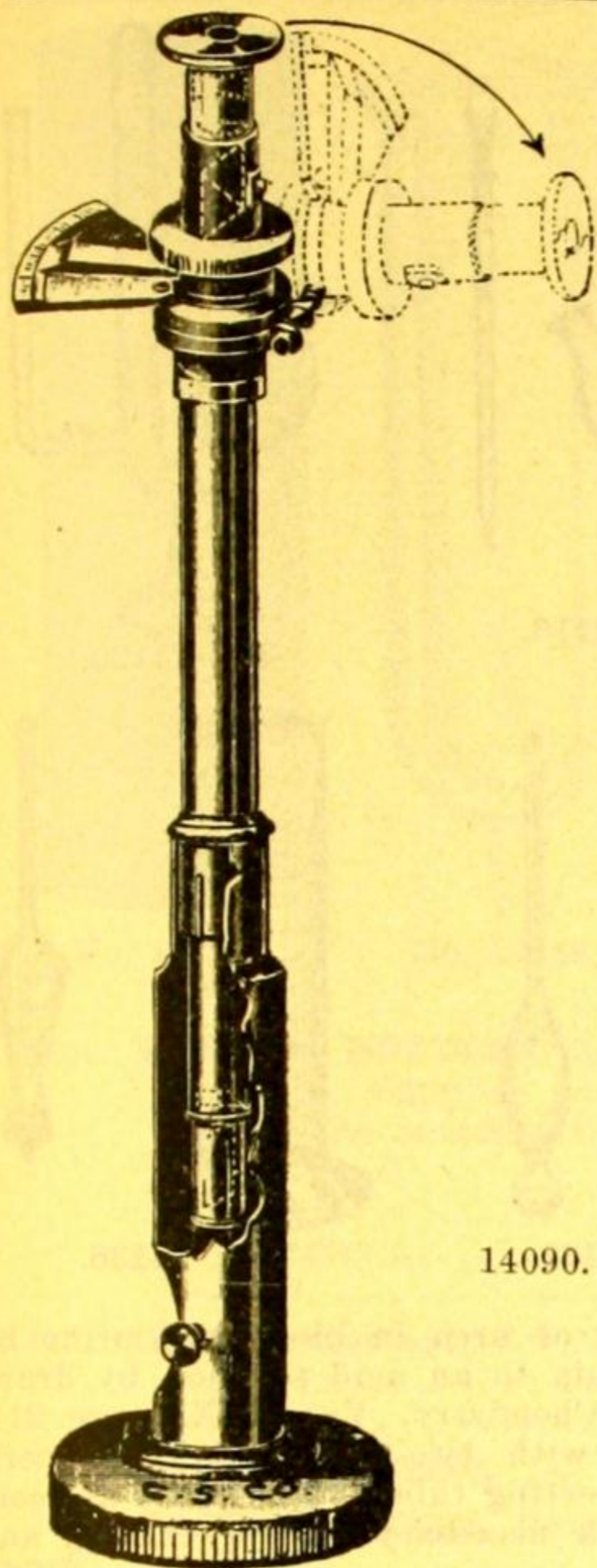


No. 14089.



No. 10887.

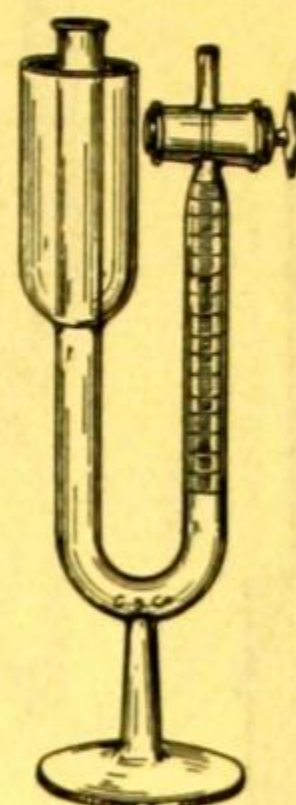
156. **AMMONIA ABSORPTION APPARATUS**, Folin's, complete with cylinder, two hole rubber stopper, drying tube, Folin Absorption Tube No. 157 and bottle..... \$3.20
157. **AMMONIA ABSORPTION TUBE** only of No. 156. Length over all 480 mm, bent 100 mm from end 1.50
158. **CONNECTING TUBE**, only of No. 156. Takes No. 2 rubber stopper..... .30
For **CENTRIFUGE TUBES** for centrifugal method of determining chlorides, phosphates and sulphates, see general heading **Centrifuges**.
14089. **INDICANOMETER** for detecting the presence of indican in urine with Obermayer's reagent. Consists of a tapered glass tube having a strip of white glass down the back, against which the color is determined, and having three marks to indicate the quantity of urine, reagent and chloroform to be added in making the test. A blue color whose intensity is proportional to the amount, indicates indican in the urine. Complete with directions..... 1.00
10887. **SACCHARIMETER, Half-Shadow with Laurent Polarizer**. This instrument is equipped with the Laurent type of polarizer, having a quartz plate in the optical system to produce the divided field. The Laurent type is the usual form for investigations with monochromatic light from a sodium flame, the principal spectrum line of which has a wave length of 5890 Angströms. The optical rotation of the material under observation is compensated by rotating the Nicol's analyzing prism by means of a convenient lever. The half-shadow field is observed through an easily focused telescope. Readings are made in angular degrees to 0.1 degree of arc from the silvered scale graduated about the circumference of the circle, 12 mm in diameter, by means of two verniers, mounted diametrically opposite each other. A small mirror and magnifying lens are conveniently mounted in front of the graduated dial in such a manner that they can be used to illuminate and magnify the vernier scales when in any position. The trough for the observation tubes will accommodate tubes up to 200 mm long. When observation tubes of 189.4 mm are used, the graduated scale becomes direct reading in per cent. of glucose or grape sugar. With a 98.7 mm tube glucose determinations can be made to .05 per cent. Medical laboratories will therefore find this instrument of considerable convenience in making determinations of sugar in urine. The trough is provided with a hinged cover to exclude outside light. The instrument is mounted on a solid stand with a heavy tripod base. Without observation tubes or sodium burner 70.00
- 10888B. **SODIUM BURNER, Gas**, for use with No. 10887, mounted on an adjustable tripod stand, with nickel-chromium pan for salt..... 14.00
10889. **OBSERVATION TUBES, Glass**, with optical glass covers. Tubes No. A and C, when used with No. 10887 Saccharimeter, render that instrument direct reading in per cent of glucose or grape sugar, enabling it to be used for urine analysis.
- | No. | A | B | C | D |
|------------|------|------|-------|------|
| Length, mm | 94.7 | 100 | 189.4 | 200 |
| Each | 5.00 | 5.00 | 5.00 | 5.00 |
- For **RENAL FUNCTION TEST APPARATUS**, see Nos. 3048 and 3049 under the general heading of **Colorimeters**.



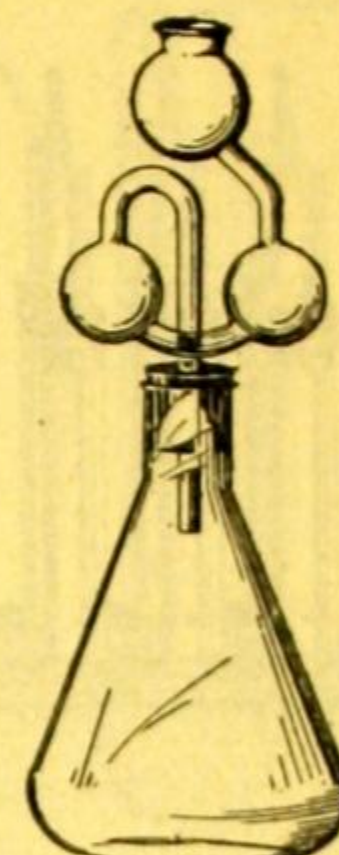
No. 14090.



No. 14092.



No. 14095.



No. 14102.

14090. **SACCHARIMETER, Urine Analysis**, for the direct measurement of the per cent of glucose or grape sugar in urine without calculation. The instrument has a fixed polarizer with a movable analyzer. An index with a vernier is attached to the analyzer mounting and permits readings to be taken on the graduated sector from 0 to 10 per cent. of glucose to 0.1 per cent. The instrument is removable from its stand and can be used with either daylight or artificial light. Complete with glass urine tube, support and case..... \$56.50

14091. **Glass Tube**, only, of 94.7 mm length for the direct determination of dextrose in urine with No. 14090 4.00

14092. **SACCHAROMETER, Einhorn's Fermentation**, for the estimation of the amount of glucose in urine by measuring the amount of carbon dioxide evolved in its fermentation by ordinary yeast. Consists of a fermentation tube on glass foot, graduated in both per cent. glucose and cc, and a test tube in which the suspension of yeast in urine is made. The mark indicates the approximate quantity of urine to use. As ordinary yeast sometimes gives gas, we recommend the purchase of an extra saccharometer in which a blank test of the yeast should be made. Complete with directions..... 1.10

14093. **Graduated Test Tube**, for measuring urine for use in No. 14092..... .15

14095. **SACCHAROMETER, Lassar-Cohn**, for the accurate determination of the per cent. of sugar in urine, either in full strength or diluted. Consists of a U-shaped tube mounted on a glass foot with one arm closed by a glass stop-cock and the other open and surrounded by a cup into which overflowing urine is caught. The closed arm is graduated to 8cc by 1/10 cc divisions. A table is provided for the conversion of the readings to per cent. of sugar. Complete with graduate for making dilutions, a box of dry yeast and full directions..... 3.50

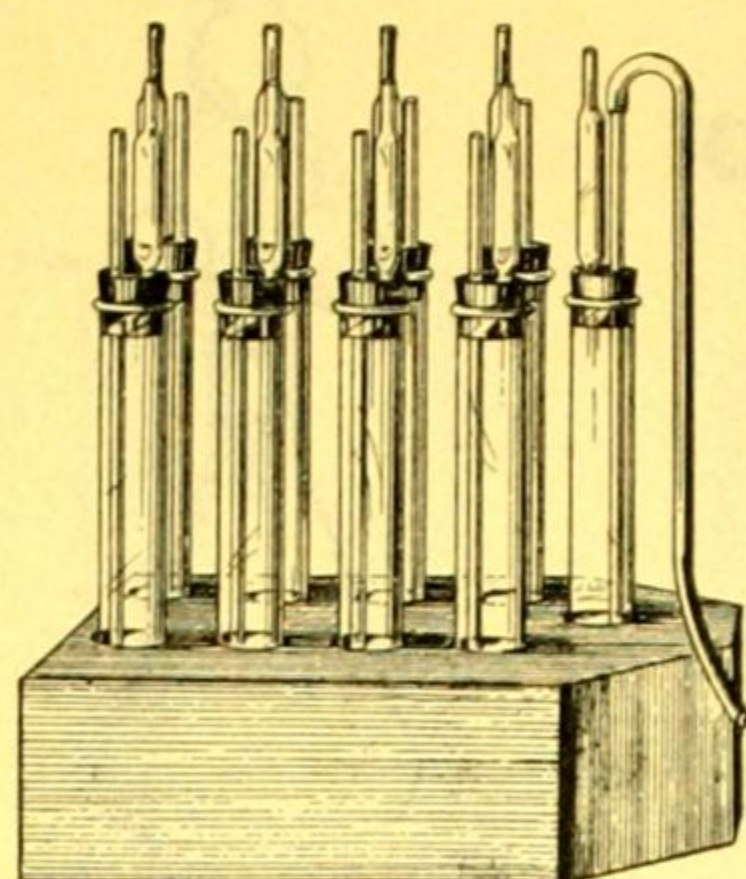
For apparatus for physical methods of determining sugar in urine, see general headings of **Polariscopes** and **Refractometers**.

For apparatus for chemical methods of determining sugar, see Nos. 1237 to 1242.

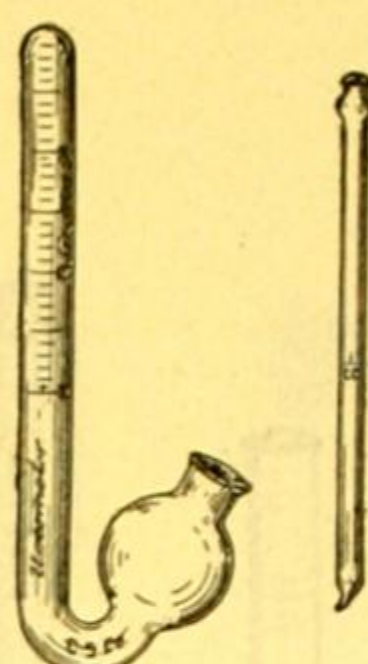
Sediment Glasses, see No. 13332 **Test Glasses**.

14102. **UREA APPARATUS, Folin**, for the determination of urea in urine by converting it to ammonia, which is expelled by heat and absorbed in an acid solution. Consists of an Erlenmeyer flask with a one-hole rubber stopper and special absorption bulb..... 2.00

14103. **UREA BULB**, only of No. 14102..... 1.50



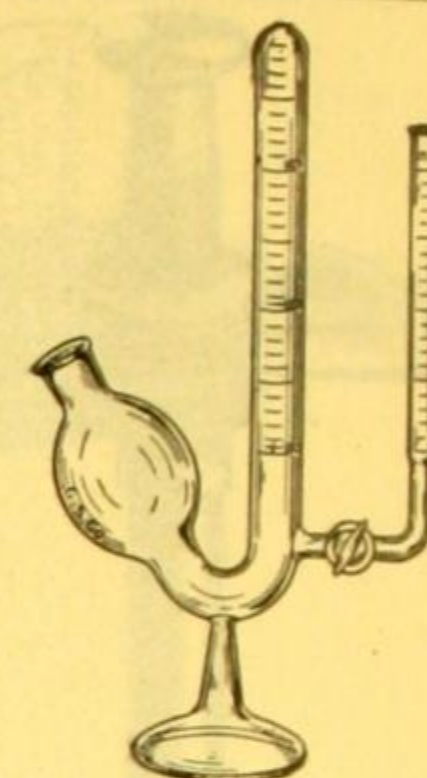
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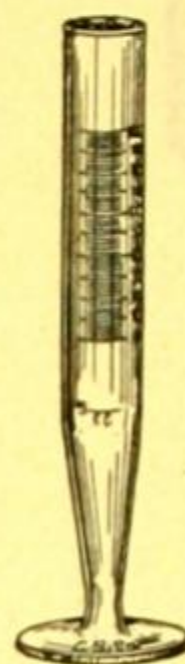
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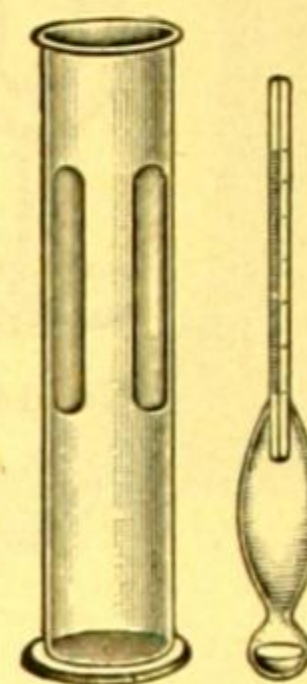
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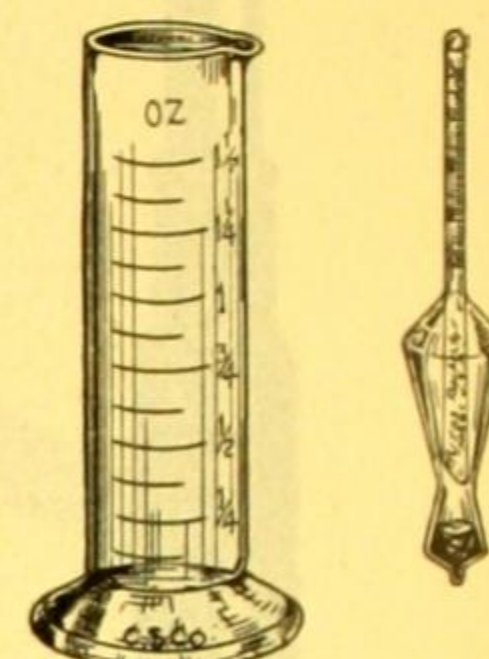
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No. 14123.

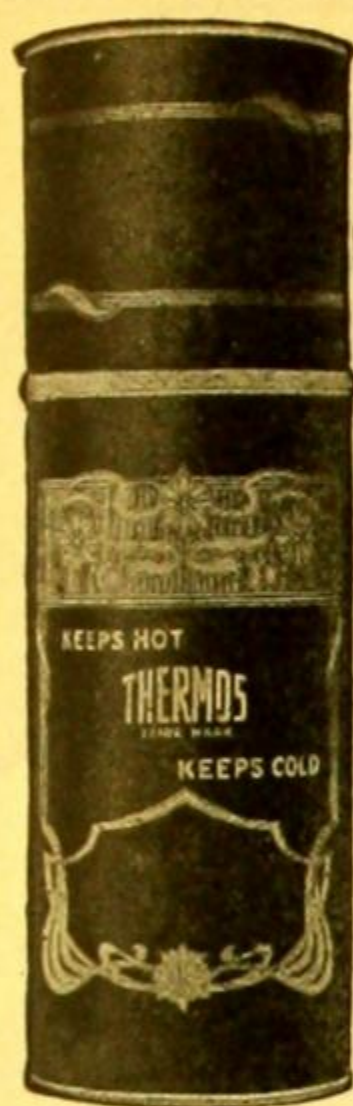


No. 14130.



No. 14136.

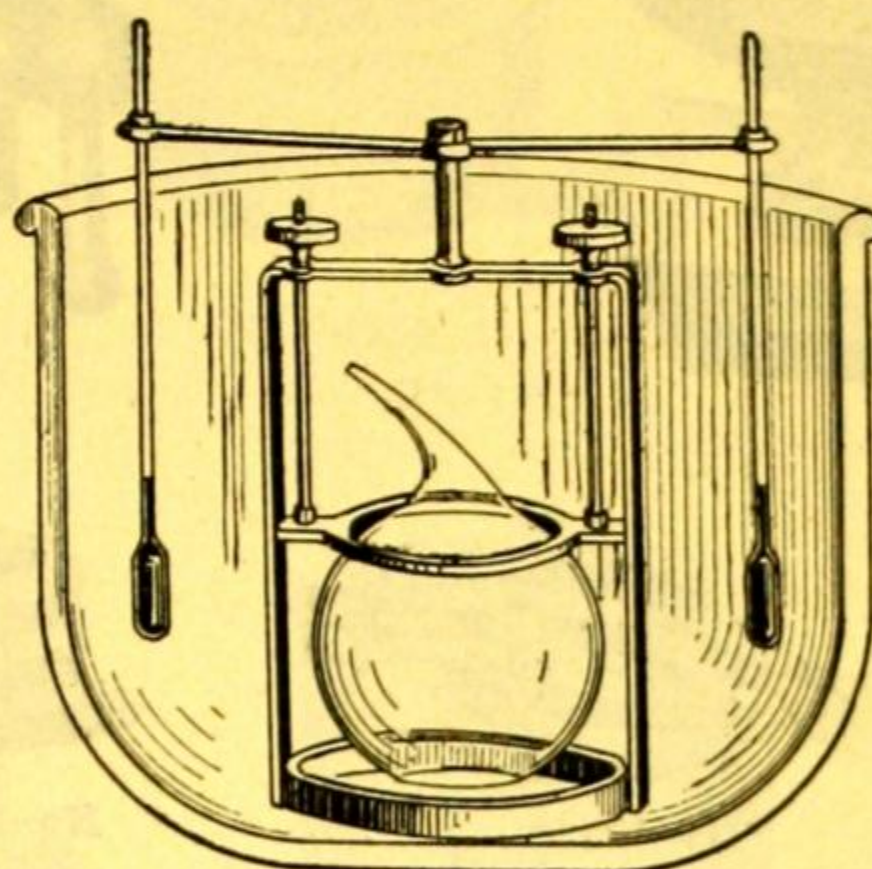
14106. **UREA APPARATUS**, Van Slyke-Cullen, for the determination of urea in blood and urine by decomposing with urease and transferring the evolved ammonia to an acid solution by drawing air through the apparatus. (See Journal of Biological Chemistry, Vol. XIX, page 211, 1914). Consists of 9 heavy walled glass urea tubes fitted with two-hole rubber stoppers, through which are inserted Folin Ammonia tubes and connecting tubes. The tubes are conveniently held in a very stable wooden block. Complete with necessary rubber tubing, and stoppers \$12.50
14107. **Folin Ammonia Tubes**, only, of No. 14106, 300 mm long by 6 mm diameter with perforated bulb 10 mm diameter..... each .40
14108. **Connecting Tubes**, only, of No. 14106, 140 mm long with bulb 15 mm in diameter..... each .25
14109. **Urea Tubes**, only, of No. 14106, heavy walled glass, 200 mm by 26 mm inside, for No. 6 rubber stopper. Without stopper, ammonia tube or connecting tube..... each .20
14110. **UREASE**, for converting urea quantitatively to ammonia, per 5 gm. bottle..... .65
14111. **UREASE**, Dunning, 25 mg. tablets for the estimation of urea in blood and urine, per box of 40 tablets 1.00
14114. **UREOMETER**, Doremus', for the rapid quantitative determination of urea in urine by the hypobromite method. Consists of a graduated pipette and a fermentation tube graduated to read to 1/10 per cent. Complete with directions for use..... 1.00
14116. **UREOMETER**, Doremus', same as No. 14114, on glass foot..... 1.60
14117. **DROPPING PIPETTE** only for Nos. 14114 and 14116, graduated at 1 cc..... .15
5290. **SUPPORT**, Hardwood, with brass clips, for No. 14114..... 1.00
14120. **UREOMETER**, Doremus'-Hinds, similar to No. 14116, but with a glass graduated side tube with glass stop-cock for delivering accurate amounts of urine without permitting the escape of gas from the bulb. Complete on glass foot and with directions..... 3.00
14123. **Urin-Acidimeter**, for rapidly determining the volume per cent. of tenth normal sodium hydroxide solution required to neutralize the acidity of urine. Consists of a tapered glass tube with marks at 5 cc and 10 cc and with the volume between 10 cc and 20 cc divided into 100 equal parts, numbered on every tenth line to 100. As the average acidity of a 24 hour mixed specimen of urine is between 30 and 40, abnormal and subnormal acidity is instantly revealed by this determination. Complete with directions 1.00
- For other apparatus for determining the acidity of urine see general heading of **Colorimeters** for H-ion determinations and No. 10312 **Wendt's Apparatus**.
14130. **URINOMETER**, Squibb's, for the determination of the specific gravity of urine. Length, 5 inches. Graduated from 1.000 to 1.045. Guaranteed accurate for temperatures of 77° F. In case, with fluted cylinder and directions, without thermometer 1.20
14131. **Urinometer**, Float, only, of No. 14130..... 1.00
14133. **Cylinder**, only, of No. 14130..... .25
14136. **URINOMETER**, small size, for testing samples of 1½ ounces. With specific gravity scale accurate at 77° F. and graduated from 1.000 to 1.045 by 0.001 divisions. The float body is of special design to prevent clinging to the sides of the jar. Complete with test jar graduated to 1½ ounces by ¼ ounces..... 3.00
14137. **Urinometer Float**, only, of No. 14136..... 2.50



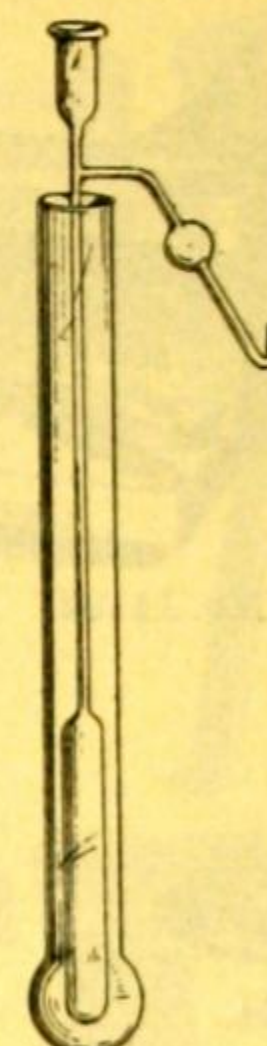
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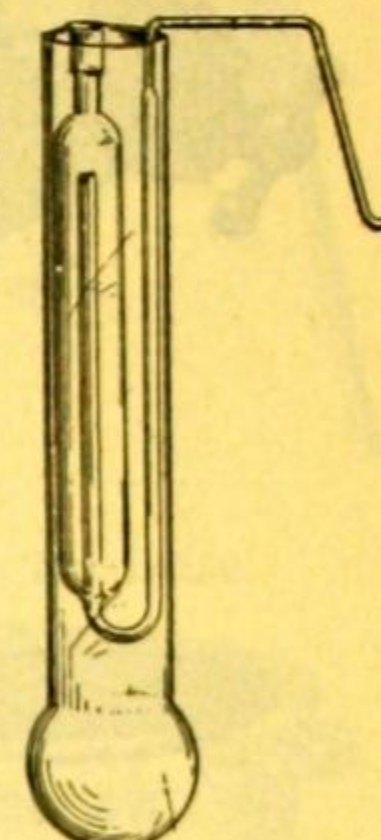
No. 14156.



No. 14164.



No. 14170.



No. 14178.

14150. **VACUUM BOTTLES**, for keeping hot liquids hot and cold liquids cold, with re-enforced vacuum chamber. Supplied with large size drinking cup, securely fastened to the case, preventing leakage of the contents through loosening the cork. Finished in red japan, with nickeled top and base.

No.	A	B
Capacity	pint	quart
Each	\$2.00	3.25

14151. **Glass Bottles** only for No. 14150, for replacement.

No.	A	B
Each	1.35	2.00

VACUUM PUMPS, see Pumps, Air.

VACUUM TUBES, Dewar's, double walled, for liquid air experiments.

No.	B	C	D
Length, outside, cm.....	20	30	35
Diameter, outside, cm.....	5.5	6.5	9
14154. Tubes, Silvered	6.25	11.00	20.00
14156. Tubes, Unsilvered	5.50	10.00	18.50

VALENCE BLOCKS, see Models.

VAPOR DENSITY APPARATUS

14164. **VAPOR DENSITY APPARATUS**, Dumas, complete with kettle and bulb support, but without thermometer or bulbs..... 15.00
856. **Dumas Bulbs** for No. 14164, capacity about 200 cc Each .30
14170. **VAPOR DENSITY APPARATUS**, Victor Meyer, complete with outer jacket of glass, 25 inches long and 1½ inches in diameter, inner tube 33 inches long, without bottle for containing the liquid to be tested..... 2.40
14171. **Bottles**, small, glass stoppered, for use with No. 14170 Each .25
Per dozen 2.50
14172. **Inner Tube** only of No. 14170, with side arm..... 1.10
14173. **Outer Jacket** only of No. 14170, of glass..... 1.30
14178. **VAPOR DENSITY APPARATUS**, Weiser's Modification of Victor Meyer's, designed to shorten the apparatus while retaining all the desirable features of the original. Length of outer jacket, 32 cm; diameter of outer jacket, 6 cm; capacity of vaporization bulb, about 125 cc. Complete as described with 2 glass stoppered bottles. (See Journal of Physical Chemistry, Vol. XX, No. 6, page 532, for June 1916)..... 3.75
14179. **Inner Tube** only of No. 14178..... 2.25
14180. **Outer Jacket** only of No. 14178..... 1.50

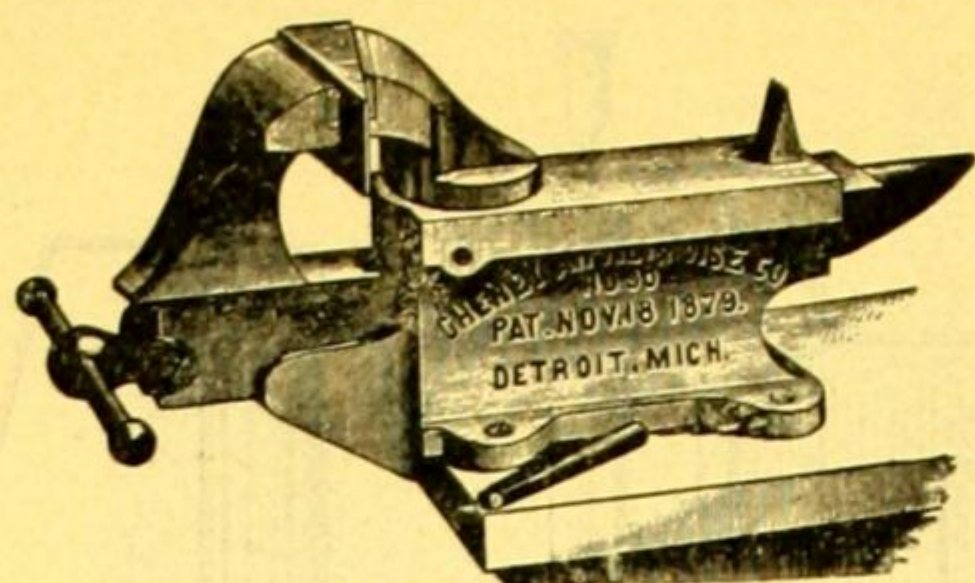
VASCULUM, see Botanical Apparatus.

VERNIER CALIPERS, see Calipers.

VIALS, see Bottles.

VISCOSITY PIPETTE, see Physical Chemistry Apparatus.

VISCOSIMETERS, see Oil Testing Apparatus.



No. 14188.



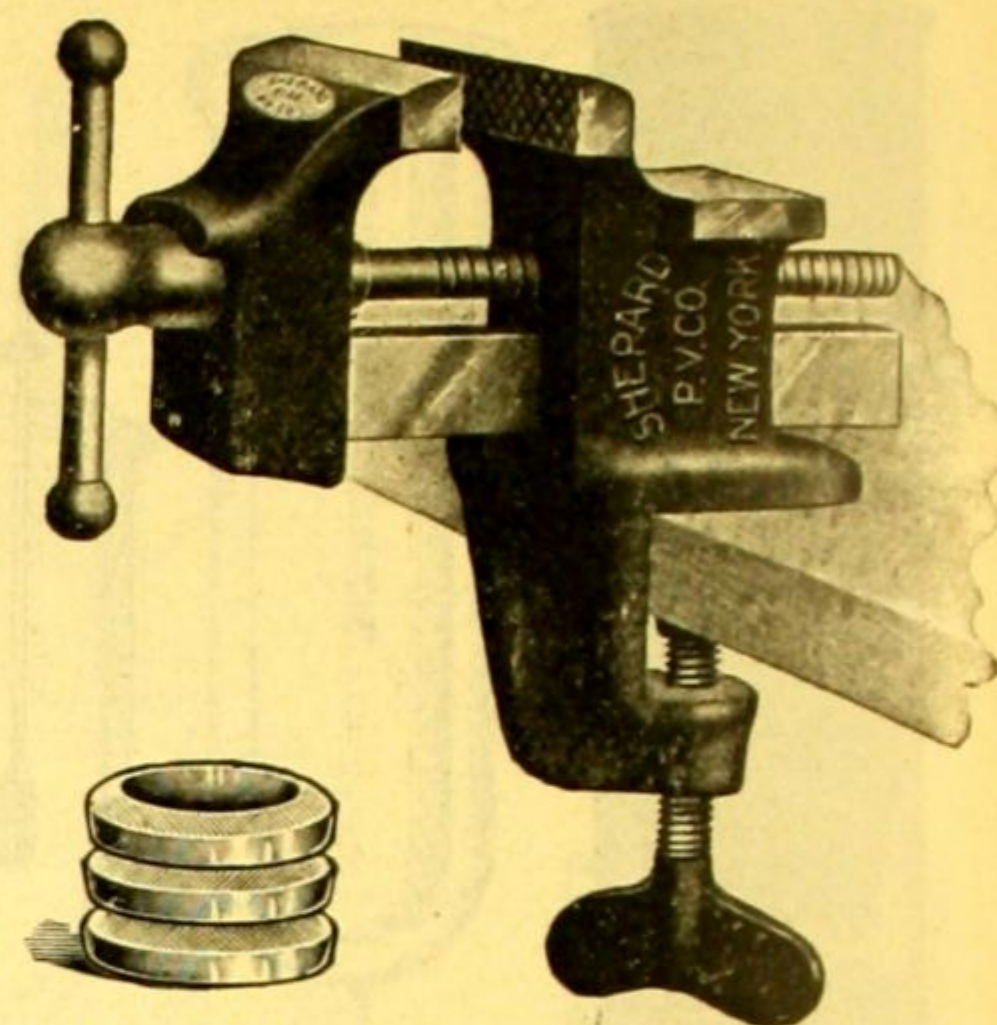
No. 14224.



No. 14228.



No. 14236.



No. 14192B.

14188. **VICES**, Anvil, adjustable jaws, strongly constructed. Base is drilled to fasten rigidly to bench by screws.

No.	A	B
Width of opening, inches.....	3	4
Width of jaw, inches.....	2½	3½
Weight, pounds.....	9	25
Each.....	\$9.00	12.50

14190B. **VICE**, Anvil, with clamp. Provided also with a steel base drilled to fasten rigidly to bench by screws. Width of opening, 3½ inches; width of jaw, 2¾ inches; weight, 9 pounds 4.00

14192B. **VICE**, Anvil, with clamp, small. Very convenient for laboratory use. Width of opening, 1¾ inches; width of jaw, 1¼ inches; weight, 2½ pounds..... 1.75

VOLTMETERS, see **Electrical Instruments**.

VOLUME OF LOAF APPARATUS, see **Flour Testing Apparatus**.

WARMING TABLE, see Nos. 8862, 8864, 8936 and 9181.

WARM STAGES, see **Microscope Accessories**.

WASHING BOTTLES, see **Bottles**.

WASHING BOTTLES for Gas, see **Gas Washing Bottles**.

WASTE JARS, see **Jars**.

14224. **WATCH GLASSES**, well annealed, with edges smoothly ground.

Diameter, inches.....	1½	2	2½	3½	4	4½	5	6	7	8
Per 10.....	.30	.40	.60	.85	.90	1.10	1.40	1.80	2.40	3.00

20% discount in lots of 100.

14226. **WATCH GLASSES**, in Pairs, with edges ground to fit accurately together, for use with Clamp No. 2902. Diameter, 2½ inches.....Per pair .40

14228. **WATCH GLASSES**, in Pairs, same as No. 14226, with Clamp No. 2902. Diameter, 2½ inches. Per pair with clamp..... .50

WATCH GLASS CLAMPS, see **Clamps**.

824. **WATCH GLASSES**, Counterpoised, for use on balance pans.

Diameter, mm.....	62	75
Per pair.....	.60	.60

WATCH GLASSES, Embryological, see **Dishes**, **Staining**.

14236. **WATCH GLASSES**, Syracuse, plain; outside diameter 65 mm; inside diameter, 50 mm. Grooved to facilitate stacking.....Per dozen 1.20

10% discount in lots of 144.

14238. **WATCH GLASSES**, Syracuse, same as No. 14236, with beveled surface ground for writing.Per dozen 1.50

10% discount in lots of 144.

14244. **WATCH SPRINGS**, for burning in oxygen.....Per dozen .20

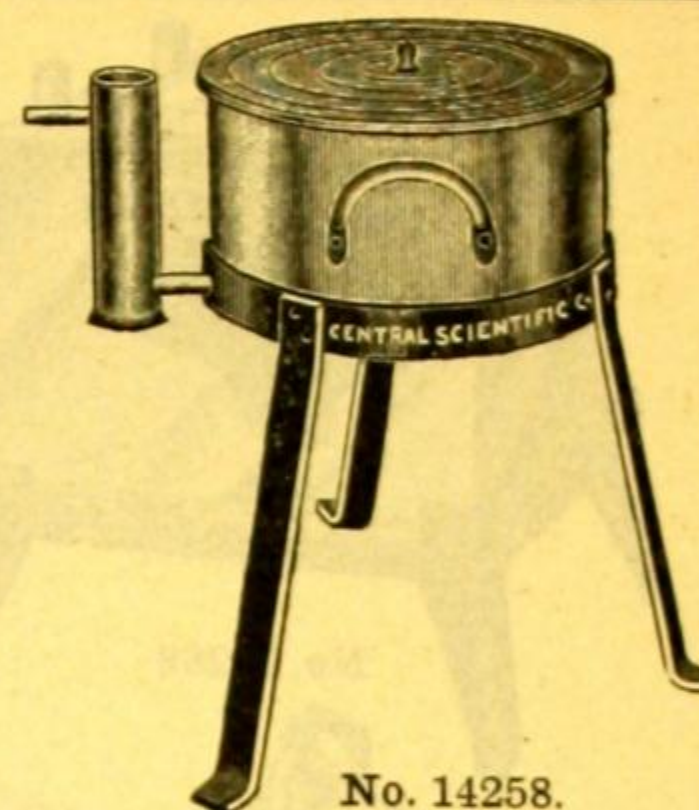
10% discount in lots of 144.



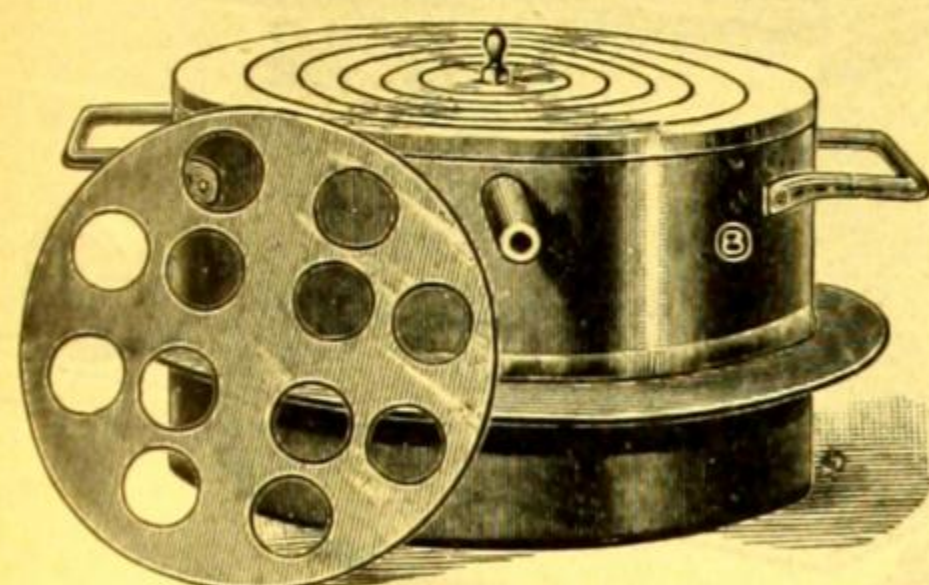
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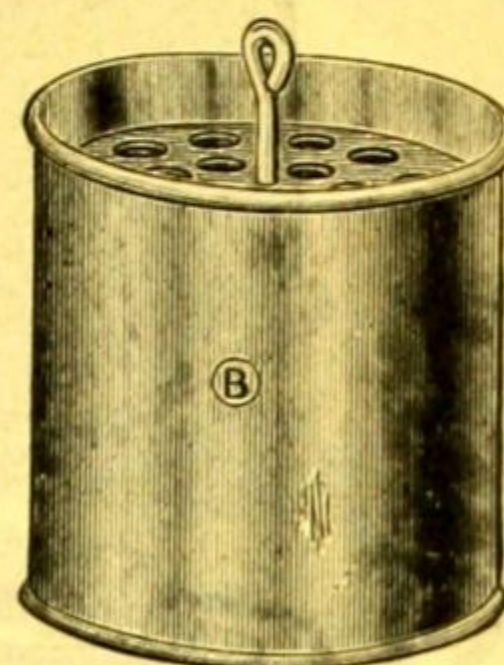
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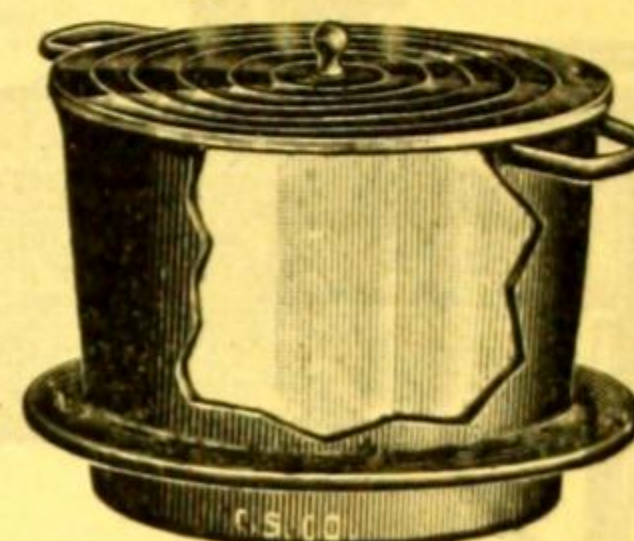
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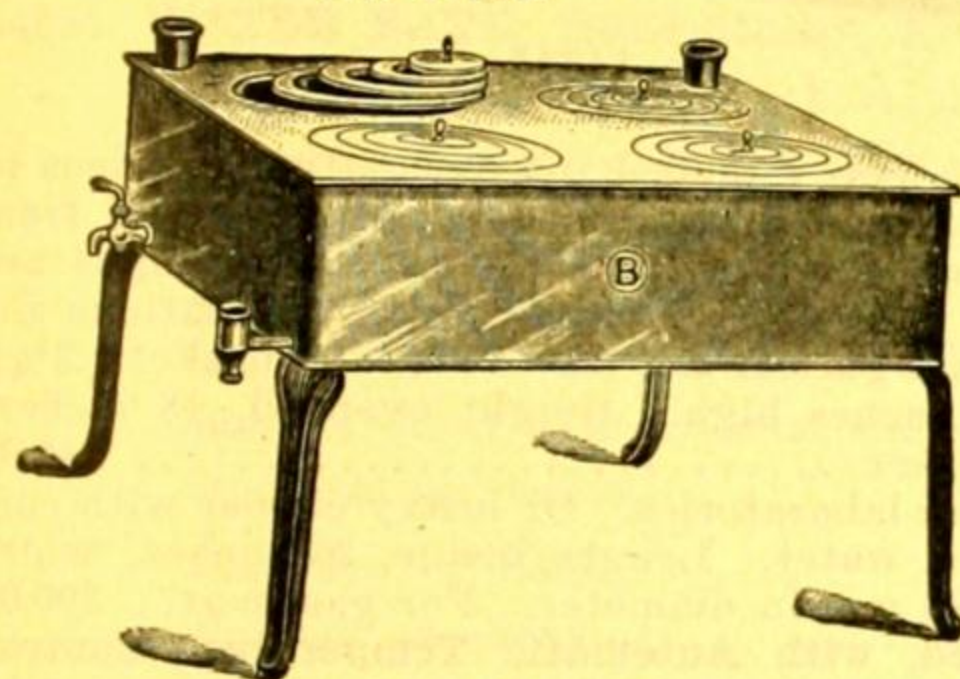
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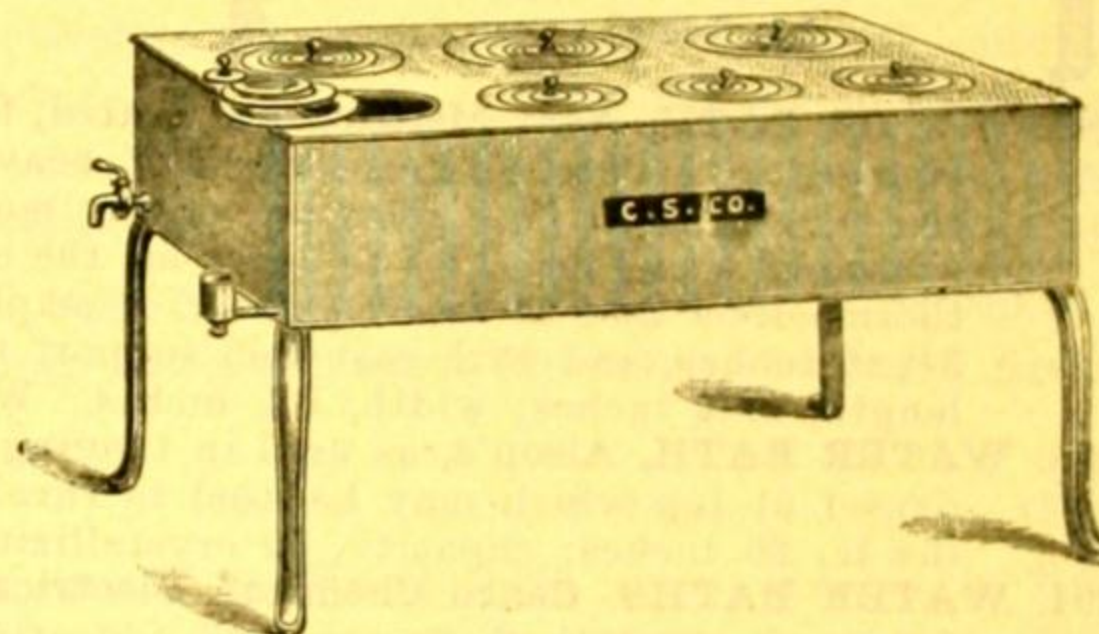
No. 14266.



No. 14263.



No. 14272.



No. 14276.

WATER BATHS

14250. **WATER BATHS**, polished copper, tin lined, with concentric copper rings and cover, handles and steam escape.

Diameter, inches	4	5	6	8	10
Number of rings	3	4	5	6	8
Each	\$1.40	1.75	2.25	3.50	5.50

14254. **WATER BATHS**, polished copper, same as No. 14250, with constant water level.

Diameter, inches	4	5	6	8	10
Number of rings	3	4	5	6	8
Each	2.60	2.95	3.45	4.70	6.70

14258. **WATER BATH**, polished copper, with 5 concentric rings and water level regulator. Diameter, 6 inches; depth, 4 inches. Complete with iron tripod 9 inches high.

14262. **WATER BATHS**, seamless polished copper, tin lined, with copper concentric rings and cover, steam escape, handles, flange for tripod, and perforated plate for test tubes up to $\frac{5}{8}$ inch in diameter.

Diameter, inches	6	8
With plate for, tubes	12	19
Each	4.25	7.00

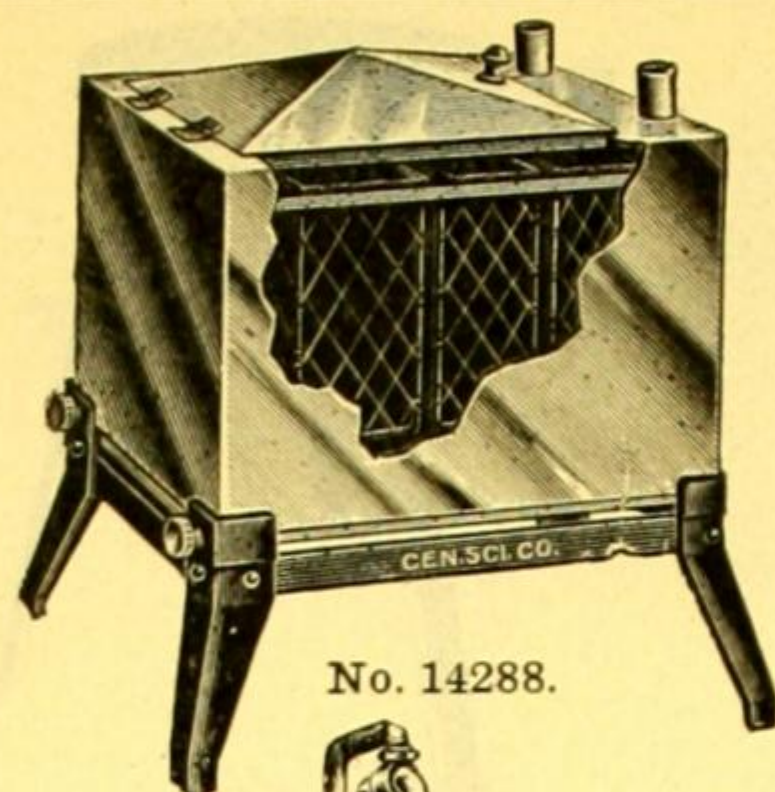
14263. **WATER BATH**, Enameled Iron, similar to No. 14258 but of iron, heavily enameled inside. Diameter, $7\frac{1}{2}$ inches.

14266. **WATER BATH**, for dissolving steel samples, of polished copper, tin lined, with zinc tray for 18 test tubes $6 \times \frac{5}{8}$ inch. Diameter, 6 inches; height, 7 inches.

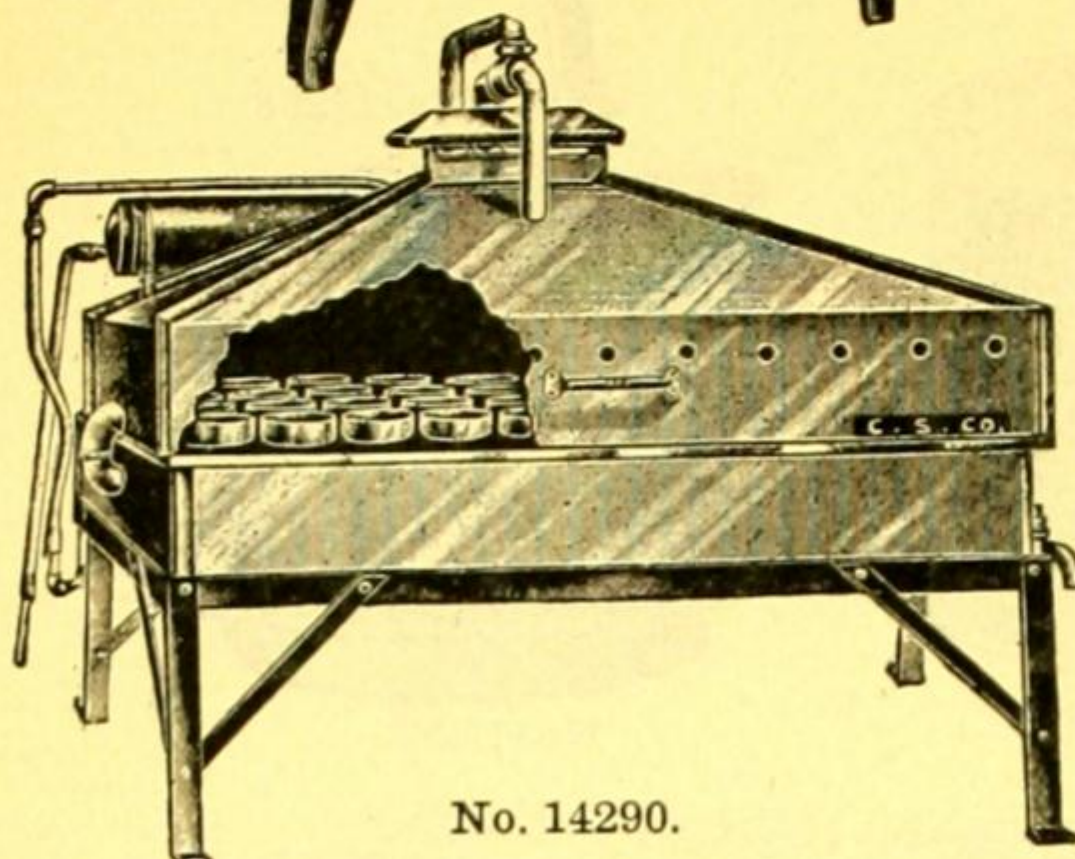
14272. **WATER BATH**, rectangular form, with 4 openings 5 inches in diameter, with concentric rings, and cover, stop-cock for draining, constant water level regulator, tubulatures for thermometer and thermo-regulator, and an extra sheet iron bottom, mounted on heavy iron support. Dimensions, 14 inches square by 5 inches deep.

14276. **WATER BATH**, of similar construction to No. 14272, but with 7 openings, 3 of 6 inches diameter, and 4 of 4 inches. Dimensions, $23 \times 13\frac{1}{2} \times 5$ inches deep.

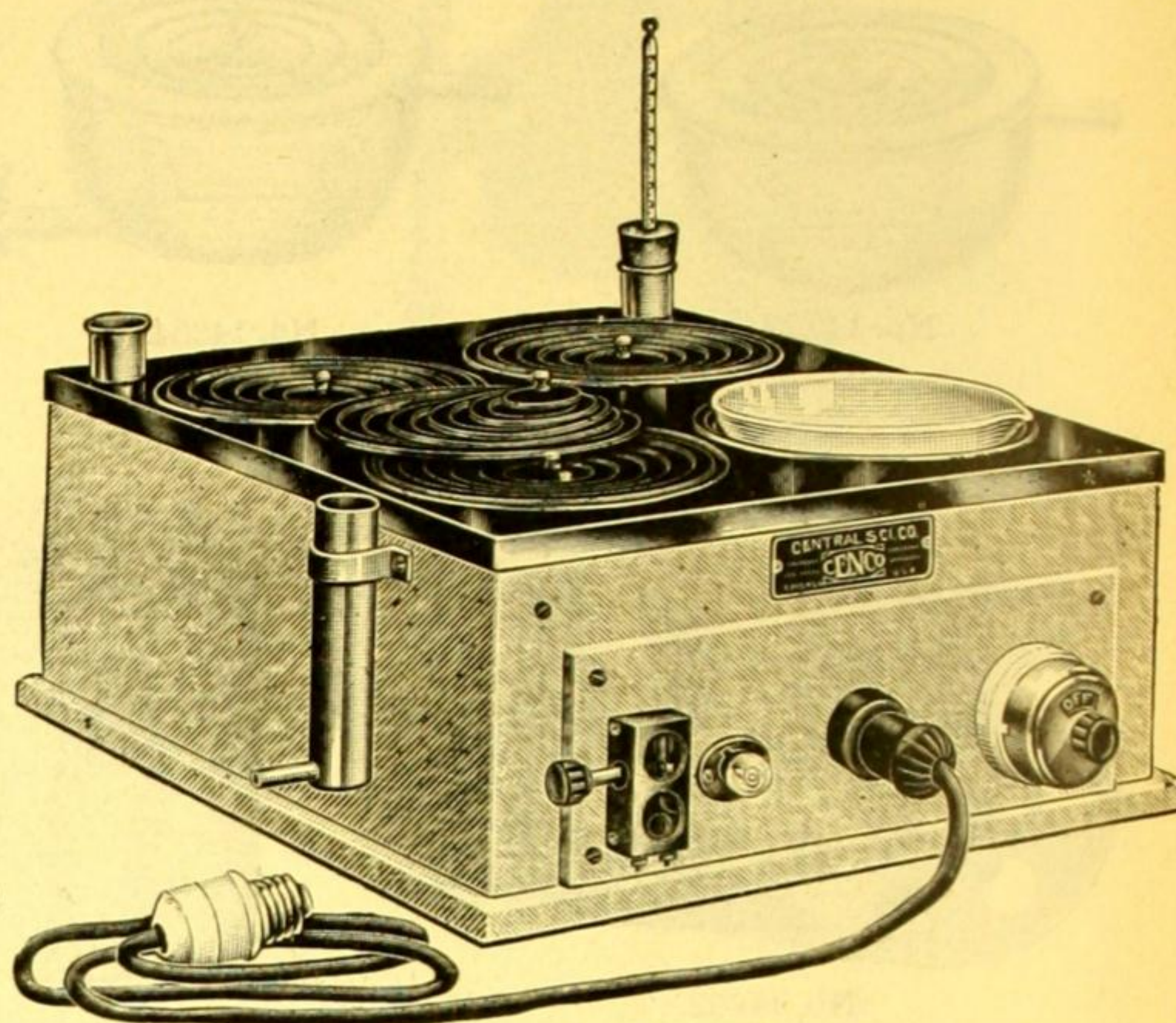
14278. **WATER BATH**, same as No. 14276, but with coil for steam heat.



No. 14288.



No. 14290.



No. 14294.

14288. **WATER BATH, Agar Melting**, gas heated, for keeping agar liquefied for inoculation previous to pouring into Pétري dishes. Made of heavy copper tinned inside, with lid which slopes from the center to all four sides preventing moisture from dripping into the tubes. Troughs are arranged along the sides to carry off the condensed moisture. Provided with tubulations for thermometer and thermo-regulator. Complete with six galvanized wire test tube baskets, $3\frac{1}{4} \times 3\frac{1}{4} \times 6$ inches, and with cast iron support stand $8\frac{1}{4}$ inches high. Height over all, 18 inches; length, $11\frac{1}{8}$ inches; width, $7\frac{3}{8}$ inches. Without burner \$40.00
14290. **WATER BATH, Alsop's**, as used in tanning and leather laboratories. Of heavy copper with condenser at top which may be used to furnish distilled water. Length inside, 25 inches; width inside, 20 inches; capacity, 60 crystallizing dishes 80 mm in diameter. For gas heat.. 300.00
14294. **WATER BATHS, Cenco Chemical, Electrically Heated, with Automatic Temperature Control**, for use in analytical, process and educational laboratories for practically every purpose requiring a water or steam bath.

The bath is made of heavy copper lined with tin and covered with a layer of insulating material (transite) which serves to retain the heat and also forms a rigid framework for the bath. A heavy sheet of transite forms the base and is provided with rubber bumpers at the corners to support it above the table. Four openings in the top, 6 inches in diameter, are supplied with concentric rings, and tubulations are provided for thermometer and stirrer. A constant water level regulator is attached to one side of the bath. An inner false bottom of woven wire serves as a support for flasks and other vessels.

The bath is heated by six heating units of chromel wire wound on mica, one of which is always in the circuit when the bath is connected. Three of the units may be added to the circuit one at a time by means of a multiple point switch. The other two are connected to the contact points of a DeKhotinsky bimetallic thermo-regulator, which may be set to maintain automatically any desired temperature. A pilot lamp indicates to the operator that the regulator is functioning properly, and assists in setting for any temperature.

The entire electrical system is contained in a removable drawer, on the front of which are mounted the controlling switch, regulator head, pilot lamp and attachment receptacle. This drawer may be easily removed to replace a unit, should this ever become necessary.

The Cenco Chemical Bath may be used either as a steam bath, or as a water bath set for any desired temperature. This feature makes it valuable for a great variety of purposes in the laboratory, including extractions, digestions at constant temperature, organic preparations, solubility measurements, phosphate precipitations, etc.

Specifications.

Length, 17 inches. Width, 15 inches. Height, 7 inches.
 Water required to fill bath to depth of 3.5 cm, 8 liters.
 Time required to boil water with all openings closed, 90 minutes.
 Maximum wattage consumption, 990 watts.
 Constancy of control at any temperature, 1 degree C.

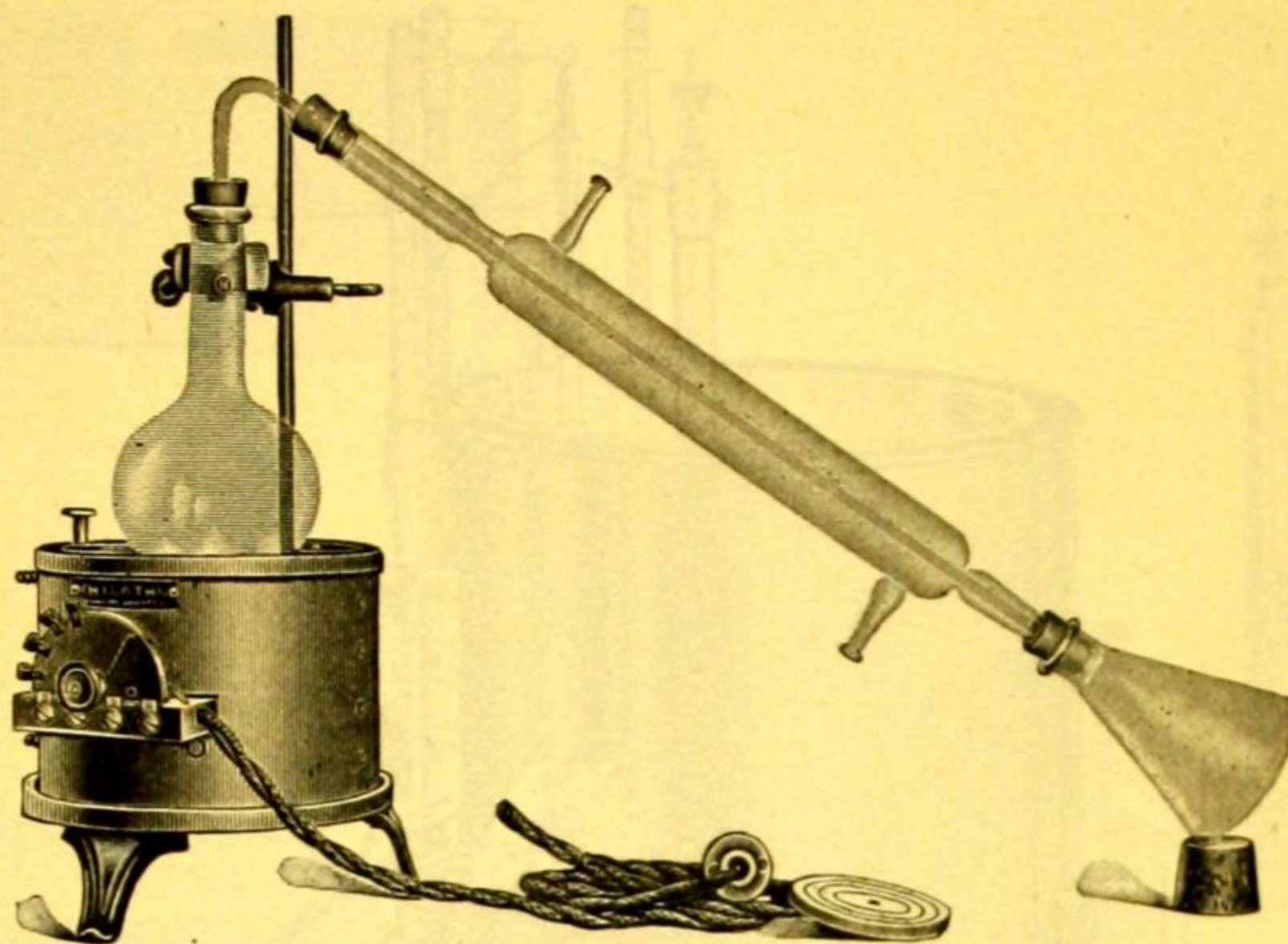
Complete as described with six feet of connecting cord and separable attachment plug, with complete directions for operating.

No.	A	B
For volts	110	220
Each	85.00	85.00

Note:—This water bath must be used on a line rated to carry 10 amperes or more.

14295. Extra Heating Units for No. 14294.

For volts	110	220
Each	.75	.75



No. 14296.

14296. **WATER BATH, DeKhotinsky, Electrically Heated**, intended to replace the ordinary Bunsen burner heated bath, in laboratories where electric current is available. The bath consists of a copper container $\frac{1}{2}$ mm (0.02 inch) thick, spun in one piece and nickel-plated. It is lagged with 25 mm (1 inch) of magnesia-asbestos and protected outside by red fiber. The bath is attached to an enameled cast-iron base, fitted with a nickel-plated supporting rod, to which laboratory clamps may be attached for the support of flasks, condensers, etc. The top of the bath is fitted with a set of six porcelain rings to accommodate the different sizes of flasks or evaporating dishes.

Capacity of bath.....	1000 cc.	Height (without stand).....	12.5 cm.
Volume of container.....	1400 cc.	Height (inside)	9.5 cm.
Diameter (outside)	19 cm.	Height (with stand).....	18.5 cm.
Diameter (inside)	14 cm.	Weight	10 lbs.

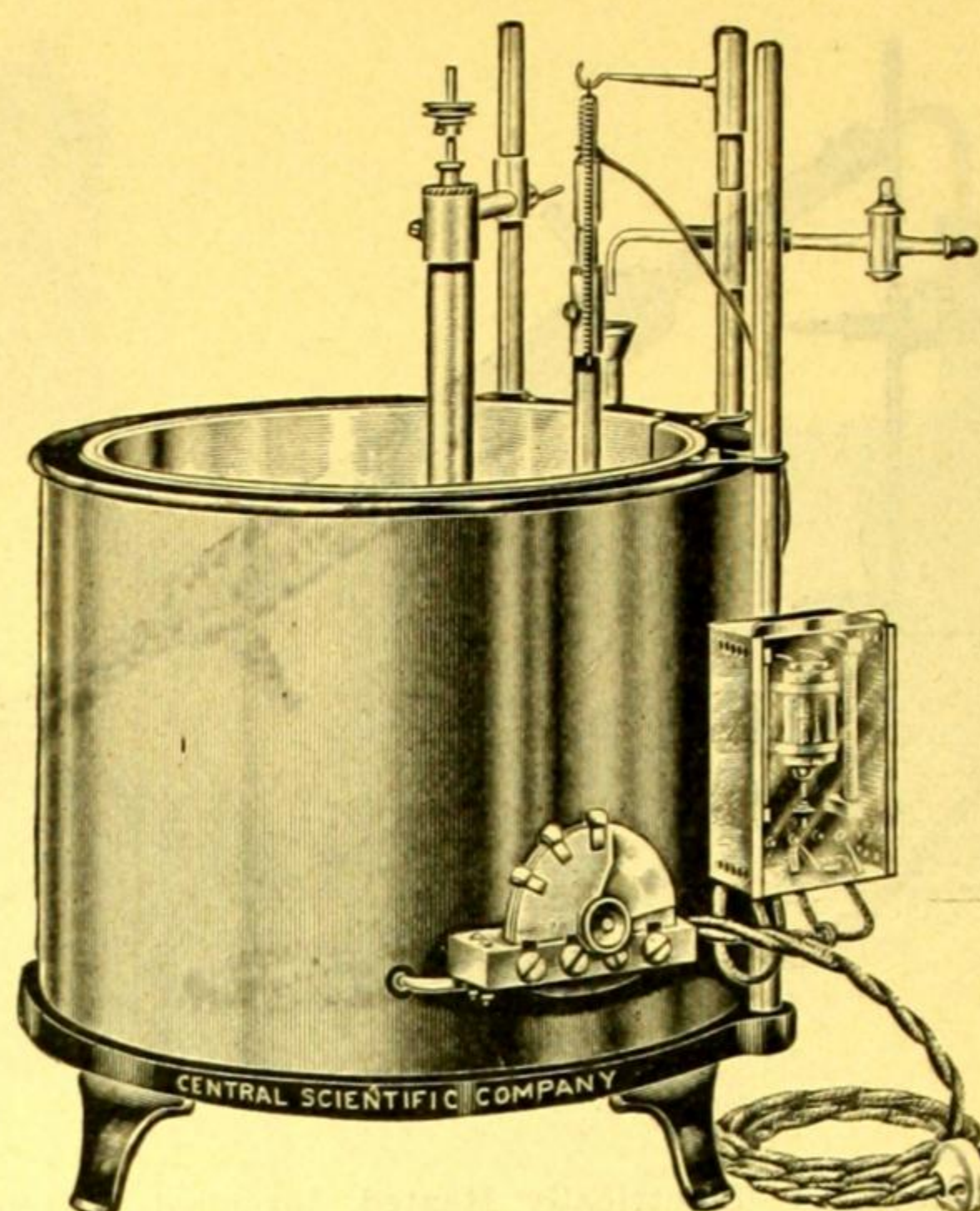
Four electric heating units of 60 watts each are used to supply heat to the bath. These units may be added one by one, by means of the switch which constitutes a part of the bath, and the desired temperature thus secured. The bath has a constant water level attachment, by means of which the water level may be kept constant at any point within a range of 25 mm (1 inch). The regularity of the water level is 1 mm. To prevent the possibility of ignition of inflammable vapors which are being distilled on the water bath, the switch is entirely enclosed.

As the heating units are inserted in brass tubes placed permanently inside of the bath, 20 mm from the bottom, their heating value comes to 99 per cent. of the theoretical expenditure of energy. Placed as they are, the heating units are absolutely protected from accidental injury. To replace these units takes no more time or skill than to replace an incandescent lamp in its socket. This bath operates on either a direct or alternating current, and may be attached to any Edison socket. Complete as described, **without glassware**.

No.	A	B
For volts	110	220
Each	\$40.00	40.00

14297. **Heating Units, extra, for No. 14296, 60 watts each.**

No.	A	B
For volts	110	220
Each	1.00	1.25



Nos. 14300-3.

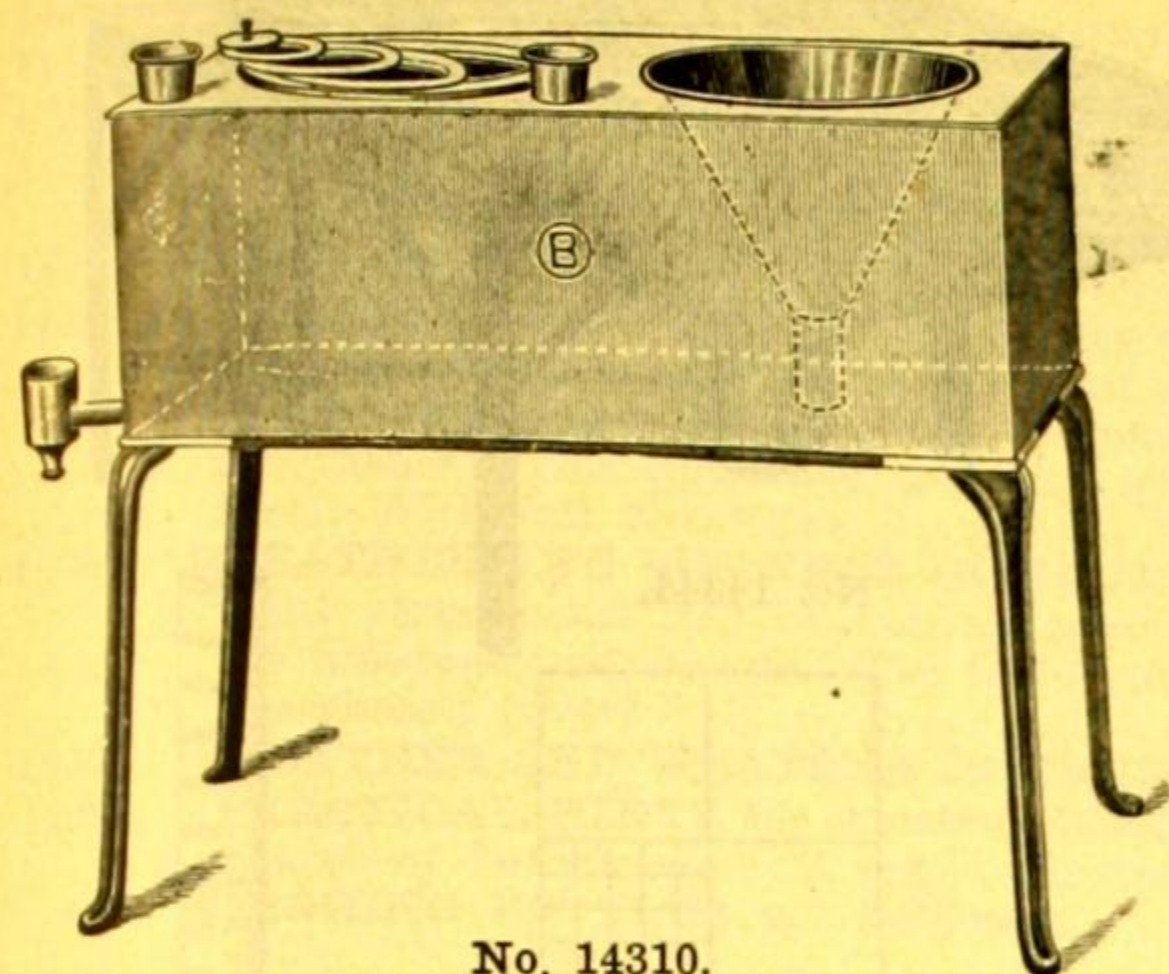
WATER BATH, DeKhotinsky, Electrically Heated and Regulated (Patented), intended for use in modern chemical, physical and bacteriological laboratories, where constant temperature to $\frac{1}{10}^{\circ}$ C. is imperative. It consists of a copper container $\frac{3}{4}$ mm ($\frac{1}{32}$ inch) in thickness, heavily nickel-plated inside and out, lagged with 25 mm (1 inch) magnesia-asbestos (magnesia 85%), and protected outside by a sheet of Russia iron. The bath is attached to an enameled cast-iron base, supplied with three nickel-plated rods, to which may be attached laboratory clamps for supporting flasks, etc. Each bath is fitted with four electric heating units, three of which may conveniently be added one by one, by means of the switch constituting part of the bath. The fourth unit is electrically connected to the relay, which is automatically operated by a thermo-regulator.

The thermo-regulator consists of a solid drawn-steel tube, brass covered, nickel-plated, filled with mercury, with a platinum contact attached to a regulating cap, by means of which the bath can be regulated and set to the desired temperature, ranging from the temperature of the surrounding atmosphere to 165° C., or even higher. For temperatures above 60° C., to prevent rapid cooling by evaporation, we recommend the use of liquid petrolatum, and for temperatures above 110° C., Crisco. For temperatures within 2 degrees of room temperature and lower, No. 14306 Cooling Coil must be used. With this bath, when provided with a No. 12864 High Speed Turbine Stirrer, the temperature can be held constant to $\frac{1}{10}$ degree C., over long periods of time. Vigorous circulation is essential to close regulation in any water bath. A constant water level attachment is furnished with each bath, by means of which the water level can be regulated within a range of 35 mm ($1\frac{1}{2}$ inches) and maintained within 1 mm of the level at which it is set. This bath has a very good natural circulation, as heat is supplied inside the bath 25 mm from the bottom. For the best results, however, High Speed Turbine Stirrer No. 12864 must be attached to the bath. This stirrer of 18 mm diameter takes water from the bottom of the bath at the rate of five liters per minute, and delivers it at the top with an energy expenditure in the motor of 15 watts. On the shaft of the circulation turbine is an extra pulley to connect with glass stirrers in vessels suspended in the bath. Complete with four heating units, relay, thermo-regulator, constant water-level device, support rods, five feet of cord and attachment plug. If uniformity of temperature throughout bath is desired, stirrer should be included.

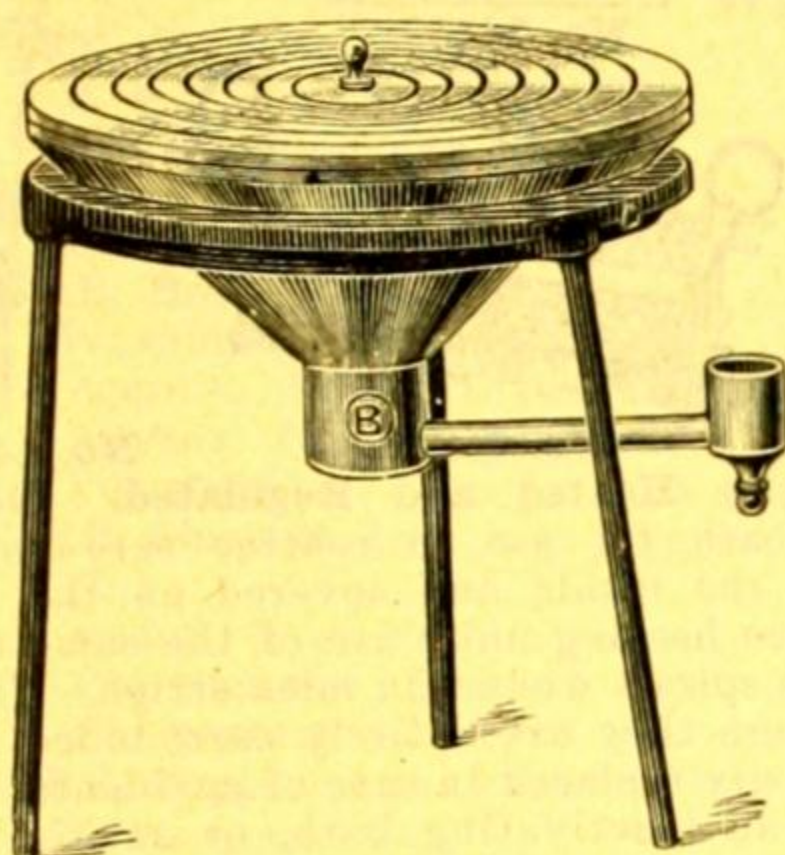
No.	A	B
Capacity, liters	9.3	18.25
Diameter inside, cm.	25	30.5
Available height inside, cm.	19	25
14300. For 110 volts A. C.	\$75.00	98.50
14301. For 220 volts A. C.	77.50	101.00
14302. For 110 volts D. C.	72.50	96.00
14303. For 220 volts D. C.	75.00	98.50

Note:—In ordering state mean temperature desired, so that heating units of correct wattage may be furnished.

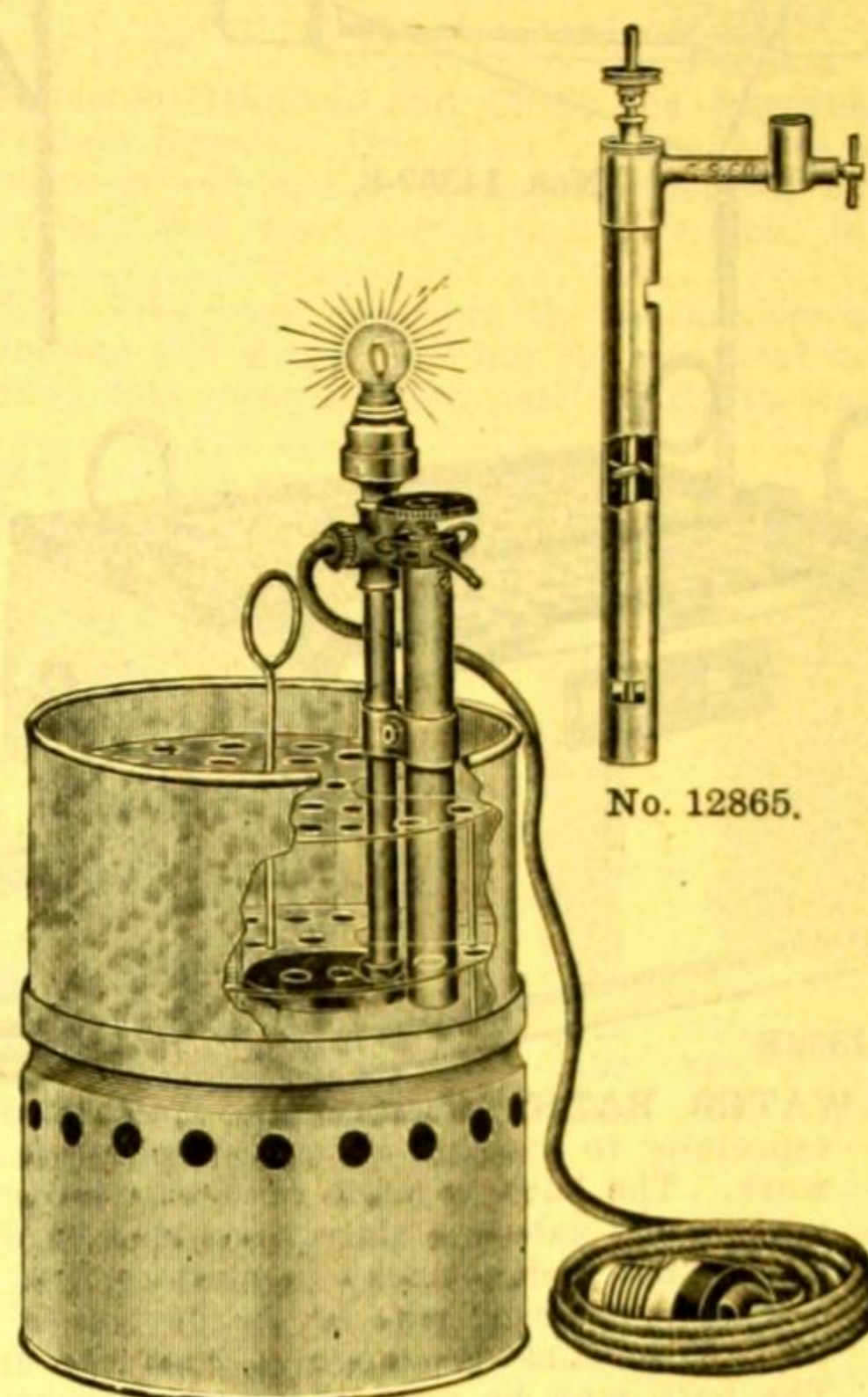
For other Water Baths for Physical Chemistry, see Nos. 10404-10410.



No. 14310.



No. 14316.



No. 14328 (Shown in Use).

No. 12865.

14306. **Cooling Coil**, for use in Water Baths Nos. 14300-3, of copper nickel-plated.

No.	A	B
For Bath No.	A	B
Each	\$12.00	15.00

14307. **Heating Units**, extra, for Nos. 14300-3.

No.	A	B
For volts	110	220
Each	1.00	1.25

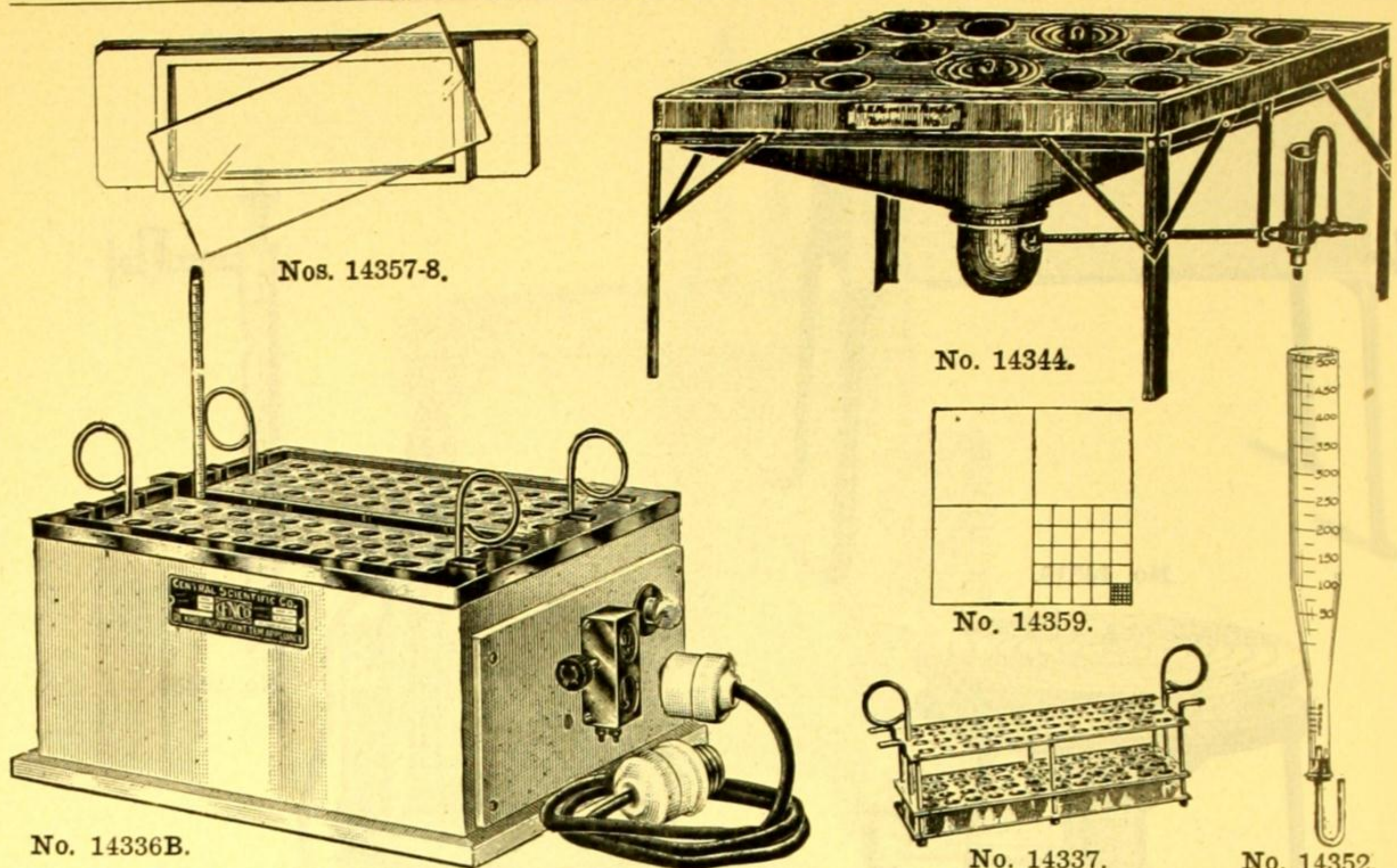
12865. **Stirrers, High Speed Turbine**, for use with Nos. 14300-3.

No.	A	B
For Nos. 14300-3	A	B
Diameter, mm	22	30
Capacity, liters per minute	5	8
Power required to operate, h. p.	$\frac{1}{16}$	$\frac{1}{12}$
Each	12.00	12.00

14310. **WATER BATH, Griffin's**, for hot filtration and evaporation. Of heavy copper, tin lined, with two 5 inch openings in the top. One opening is fitted with a copper funnel, the other is provided with four concentric copper rings. Complete with constant water level regulator and tubulatures for thermometer and thermo-regulator, mounted on support with extra sheet iron bottom and detachable legs. Dimensions, 13x7x5 inches high. 15.00

14316. **WATER BATH, Victor Meyer's**, funnel shape, of polished copper, tin lined, with concentric rings, cover and constant water level, with tripod 8 inches high. Diameter, 6 inches. 4.50

14328. **ELECTRIC HEATER AND THERMOSTAT, Combined**, for small water baths. Consists of a heating disk 5 inches in diameter by $\frac{1}{2}$ inch in thickness, mounted with an adjustable pencil-type electro-thermostat 6 inches long and $\frac{5}{8}$ inch in diameter, with a pilot lamp to indicate when the current is on or off. This outfit can be used for heating and regulation in any water bath whose capacity does not exceed 2 quarts with the depth of the water not less than 2 inches. It can be set for any temperature between 35° and 60° C., but the best results are obtained by having it set at the factory for a fixed temperature and not readjusting it. Shipping weight, 3 pounds. Complete with 6 feet of flexible cord and an attachment plug for connection to any 110 volt lamp socket. **Without water bath** 36.00



- No. 14336B. 14336B. WATER BATH, Wassermann, DeKhotinsky Electrically Heated and Regulated.** Designed especially to provide an easily operated, dependable bath for use in routine sero-diagnostic work. The bath is made of heavy copper, tinned on the inside and covered on the outside with heavy asbestos slate, enameled in white. The two heating units are of the same type as used in our DeKhotinsky incubators, i. e., chromel wire spirals wound on mica strips. They are placed in a metal tube at the bottom of the bath where they are entirely surrounded by water. Provisions are made so that the units can be easily replaced in case of accidental injury. The bath may be used at a temperature of 56°C. as an inactivating bath, or at 37.5°C. for incubating purposes. The regulation is accomplished by means of the DeKhotinsky bimetallic thermo-regulator provided with two pairs of contact points, which automatically throw into operation either one or both of the heating units as required. The thermo-regulator is placed in a metal tube, which is immersed in the bath near the heating units. A pilot lamp is furnished for indicating when the current is on or off and to assist in setting the bath to operate at any required temperature. The operating temperature is easily changed by turning the knurled knob on the side of the thermo-regulator. Two trays with places in each for 48 tubes up to $\frac{1}{2}$ inch in diameter with the holes so marked that the location of any tube may be indicated by a number and letter. Size over all 11 by 11 $\frac{1}{2}$ by 5 $\frac{1}{2}$ inches. For 110 volts A. C. or D. C.
- Complete with test tube racks, thermometer, connecting cord and attachment plug, but without test tubes \$65.00
- 14337. Test Tube Rack** only of No. 14336B, holding 48 3x $\frac{3}{8}$ or 4x $\frac{1}{2}$ inch test tubes. Made from nickel-plated brass with supports for suspension in bath, and furnished with three shelves as shown in illustration. Dimensions of rack: 8 $\frac{3}{4}$ x4x2 $\frac{3}{4}$ inches high. Height over all, 4 $\frac{1}{2}$ inches. Without test tubes 5.50
- 14338. Extra Heating Units**, for No. 14336B Each .75
- Test Tubes, Wassermann**, for No. 14336B, see No. 13390.
- 14344. WATER BATH, Wiley Patented**, designed to generate steam quickly with small gas consumption. Of heavy copper with replaceable water cup of spun copper 3 $\frac{3}{8}$ inches in diameter, with 12 openings 3 $\frac{1}{2}$ inches and 2 openings 5 $\frac{3}{4}$ inches in diameter, with concentric copper rings and constant water level regulator, mounted on substantial angle iron support. Dimensions of top, 25x14 $\frac{1}{2}$ inches; depth on outside edge, 2 inches; depth in center, 4 inches; capacity to water inlet, 250 cc. Can be operated easily by one ordinary Bunsen burner 70.00

WATER EXAMINATION APPARATUS

COLOR TUBES, see Nos. 3816 to 3030.

NESSLER JARS, see Color Comparison Tubes.

SEDGWICK-RAFTER APPARATUS, for Microscopical Examination of Water. See "The Microscopy of Drinking Water," by Geo. C. Whipple.

- 14352. Sedgwick-Rafter Funnel**, graduated, with attachment and rubber stopper 2.50
- 14353. Sedgwick-Rafter Funnel**, plain, with attachment and rubber stopper 1.75
- 14354. Berkshire Sand** per pound .10
- 14355. Bolting Cloth Disks** per dozen .25
- 14357. Counting Oell** 4.00
- 14358. Cover Slip**15
- 14359. Eyepiece Micrometer** 6.25
- 14360. Pipettes**, a set of two, one each 1 cc and 5 cc per set .45

WATER HEATERS, see Heaters.

14376. **WAX, Bees', Genuine**, unbleached, in cakes. Per lb. \$0.55
 14377. **WAX, Bees', Imitation (ceresin)**, yellow. Per lb. .65
 F2705. **WAX, Sealing**, express, red, four sticks to the pound. Per 4 oz. stick .20
 14380. **WAX, Universal**, for use in the laboratory wherever a plastic yet firmly adhesive cement is needed. In 4-ounce jars. Per jar .30
 14382. **WAX TAPERS**, for burning in oxygen, etc., in boxes of 12. Per box .10
 14390. **WEATHER FORECAST CHART, or Key to Barometer Reading, and Chart for Aneroid Barometer**, by J. Benj. F. Rawson, late of the Weather Bureau. This chart is intended as an aid in the intelligent interpretation of barometer readings and in forecasting weather for twenty-four hours. This chart will be found quite accurate and most useful in any science laboratory. With full directions. 1.00
 14392. **"WEATHER AND WEATHER INSTRUMENTS."** This book describes the mechanism of the many instruments and in addition gives in concrete and simplified form the practical uses of the different instruments. The tables of classified data recommend it particularly to teachers. Pasteboard covers.50
 14393. **"WEATHER AND WEATHER INSTRUMENTS,"** same as above, cloth covers. 1.00
 14396. **"PRACTICAL HINTS for Amateur Weather Forecasters."** Information on the care and exposure of barometers. 24 pages, illustrated.20
WEIGHING BOTTLES, see **Bottles**.

WIRE, ALL KINDS

14410. **WIRE, Aluminum, bare.**
 B. & S. No. 14 18 20 24
 Approx. diameter, inches.064 .040 .032 .020
 Per 4 oz. spool.90
 Per 1 lb. spool. 1.50 1.60 2.00 . . .
14412. **WIRE, Brass Spring, on 4-ounce spools.**
 Washburn & Moen No. 16 18 20 22 24 26 27 28 30 32 34 36
 Approx. diam., inches .063 .047 .035 .028 .023 .018 .017 .016 .014 .013 .010 .009
 Approx. ft., per spool 20 33 68 108 170 270 340 430 550 862 2270 3520
 Per spool25 .25 .25 .30 .35 .35 .40 .40 .45 .50 .55 1.00
7993. **WIRE, Chromel, in 4 inch lengths.** For bacteriological work.
 No. A B
 B. & S. Gage No. 22 24
 Per package of 10.30 .30
 Per package of 100. 2.70 2.70
14416. **WIRE, Copper, Annunciator Wire, double cotton covered and paraffined.** Orders not accepted for less than 1 lb.
 B. & S. No. 16 18 20 22
 Approx. feet per pound. 106 157 230 350
 Per pound60 .70 .80 .90
14418. **WIRE, Copper, Lamp Cord, composed of fine wires insulated with rubber and braided cotton; two conductors twisted.**
 B. & S. No. 16 18
 Per foot05 .05
 20% discount in lots of 100 feet.
- WIRE, Copper, Magnet Wire.**
 B. & S. No. . . . 10 12 14 16 18 20 22 24 26 27 28 30 32 34 36 40
 Approx. diam., inches102 .081 .064 .051 .040 .032 .025 .020 .016 .014 .013 .010 .008 .006 .005 .003
14422. **BARE WIRE.**
 Per 1 oz. spool15 .15 .20 .20 .22 .25
 Per 4 oz. spool35 .35 .40 .40 .45 .65
 Per 1 lb. spool .75 .80 .80 .80 .80 .85 .90 1.00 1.00 . . . 1.05 1.05
14423. **D. C. C. WIRE.**
 Per 1 oz. spool25 .30 .35 .40 .45 .70
 Per 4 oz. spool85 1.05 1.25 1.50 2.50
 Per 1 lb. spool .85 .90 1.00 1.10 1.20 1.50 1.65 2.00 2.25 2.50 2.80 3.25 4.00
14424. **D. S. C. WIRE.**
 Per 1 oz. spool30 .40 .50 .60 .85 1.60
 Per 4 oz. spool95 1.00 1.50 1.80 2.25 2.75 6.00
 Per 1 lb. spool 1.45 1.50 2.00 2.25 2.75 3.35 3.60 3.75 5.25 6.75
14428. **WIRE, Copper, Magnet Wire, Enameled.** The enamel insulation is an elastic yet resistant and firmly adhering film. This insulation is exceedingly inert toward the ordinary agencies met in practice, which cause silk or cotton insulation to rapidly deteriorate and lose their value as insulating mediums. Impervious to moisture. Requires less winding space. Positive dielectric strength. More feet to the pound.
 B. & S. No. 26 28 30 36 40
 Feet per oz. 80 128 200 800 2000
 Per 1 oz. spool.16 .20 .20 .25 .40
 Per 4 oz. spool.40 .45 .50 .60 1.20
 Per 1 lb. spool. 1.25 1.40 1.50

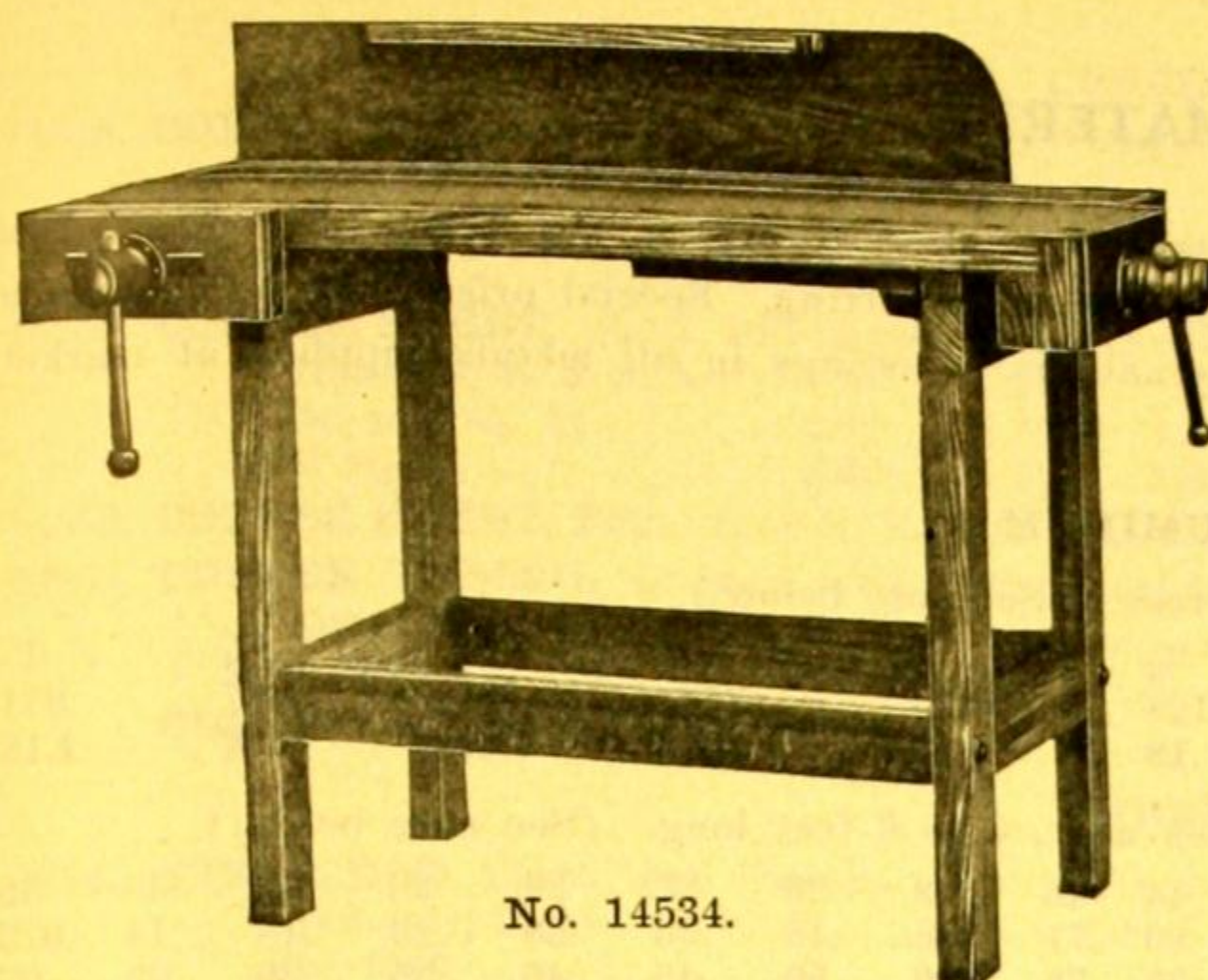
For WIRE TABLES, see page 531.

WIRE

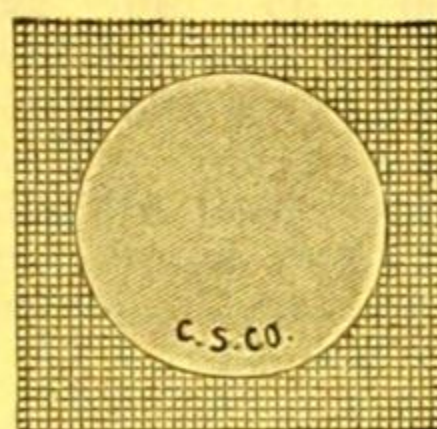
CENTRAL SCIENTIFIC CO., CHICAGO, U. S. A.

14430. WIRE, Copper, Rubber Covered.												
B. & S. No.										12	14	
Per foot										\$0.06	.05	
14432. WIRE, Copper, Soft, bare, on 4-ounce spools.												
Washburn & Moen No.	16	18	20	22	24	26	27	28	30	32	34	36
Approx. diam., inches.	.063	.047	.035	.028	.023	.018	.017	.016	.014	.013	.010	.009
Feet per spool	20	32	66	102	160	260	325	410	510	810	2050	3175
Per spool	.25	.25	.25	.30	.30	.30	.35	.40	.45	.50	.70	1.10
14438. WIRE, FUSE.												
Amperes	1/2	1	2	3	5	6	10	15	40			
Size of spools	4 oz.	8 oz.	8 oz.	8 oz.	1 lb.	1 lb.	1 lb.	1 lb.	1 lb.			
Feet per spool	400	500	340	220	168	145	82	53	17			
Per 10 feet	.10	.10	.10	.10	.20	.20	.30	.36	1.25			
Per spool	1.30	1.00	1.00	.90	1.80	1.70	1.60	1.50	1.70			
WIRE, German Silver, 18% alloy.												
B. & S. No.	16	18	20	22	24	26	28	30	32	34	36	
Approx. diam., in.	.051	.040	.032	.025	.020	.016	.013	.010	.008	.006	.005	
14440. BARE WIRE.												
Per 1 oz. spool					.22	.25	.26	.30	.33	.35	.40	
Per 4 oz. spool			.40	.45	.50	.55	.60	.65	.70	.80	.90	
Per 1 lb. spool	1.30	1.40	1.50	1.75	2.00	2.15	2.25	2.50				
14441. D. C. C. WIRE.												
Per 1 oz. spool					.20	.40	.50	.55	.60	.75	.90	
Per 4 oz. spool			.75	.80	1.10	1.35	1.60	2.00	2.25	2.50	3.00	
Per 1 lb. spool	2.25	2.50	2.75	3.75	4.25	5.00	6.00	6.75				
WIRE, Iron, see No. 14488 Steel Wire.												
14450. WIRE, Iron, Chemically Pure, for standardizing, containing 99.85 per cent Fe. In glass containers.												
Size, ounces										1	4	
Each										.30	.55	
14454. WIRE, Lead, diameter 1/8 inch.										Per foot	.05	
14458. WIRE, Manganin, Resistance. This is an alloy of manganese, nickel and copper. It is the best wire on the market for high grade measuring instruments; temperature coefficient for 1° C. = .00001. Double cotton covered.												
B. & S. Gage No.										18	20	
Per oz.										1.35	1.60	
14459. WIRE, Manganin, Resistance, same as No. 14458, but double silk covered.												
B. & S. Gage No.		22	24	26	28	30	32	34	36	38		
Per oz.		1.90	1.85	2.10	2.20	2.60	2.85	3.10	4.10	4.85		
14466. WIRE, Nickel-Copper Alloy, Ideal, bare, soft annealed, used in the manufacture of electrical instruments where extreme low temperature coefficient, accuracy and permanency are desired. Resistance is 29 times that of copper and temperature coefficient for 1° C. = +0.000005.												
B. & S. No.										22		
Per 1 oz. spool										.70		
Per lb.										2.75		
14468. WIRE, Nickel-Copper Alloy, Ideal, same alloy as No. 14466. Nos. 18 and 20 are double cotton covered. The remaining numbers are double silk covered.												
B. & S. No.		18	20	22	24	26	28	30	32	36	38	
Per oz.		1.00	1.05	1.10	1.15	1.20	1.25	1.35	1.60	2.10	3.30	
Per lb.		6.00	6.20	6.70	7.15	8.50	9.00	11.00				
14472. WIRE, Nickel-Steel-Chromium Alloy, Phenix, bare, used extensively in the manufacture of lantern rheostats, etc., where a high specific resistance combined with ability to withstand oxidation and corrosion is desired. Resistance is 50 times that of copper; temperature coefficient for 1° C. = +0.00054.												
B. & S. No.										12	16	20
Per 1 oz. spool										.65	.70	.75
Per lb.										2.50	2.75	3.00
14476. WIRE, Piano, on spools.												
Music gage No.		00	0	1	2	3	4	5	6	7	8	
Approx. diam., inches.		.0087	.009	.010	.011	.012	.013	.014	.015	.018	.019	
Approx. feet on spool		15	15	14	12	12	12	10	10	8	8	
Per spool		.15	.15	.15	.15	.15	.10	.10	.10	.10	.10	
14478. WIRE, Piano, steel in 1/4 pound rolls.												
Music gage No.				8	9	10	12	14	18	23	26	
Approx. diameter, inches.				.019	.022	.025	.028	.032	.040	.049	.061	
Per roll				.65	.65	.60	.50	.40	.40	.35	.35	
14480. WIRE, Picture, steel, in packages of 25 yards. No.										0	1	2
Per package										.15	.20	.25
WIRE, Platinum, see general heading Platinum Ware.												
14488. WIRE, Steel, annealed, soft, on 4-ounce spools.												
Washburn & Moen												
No.	16	18	20	22	24	26	27	28	30	32	34	36
Ap. diam., in.	.063	.047	.035	.028	.023	.018	.017	.016	.014	.013	.010	.009
Per spool	.10	.10	.10	.15	.15	.15	.15	.15	.15	.15	.20	.25

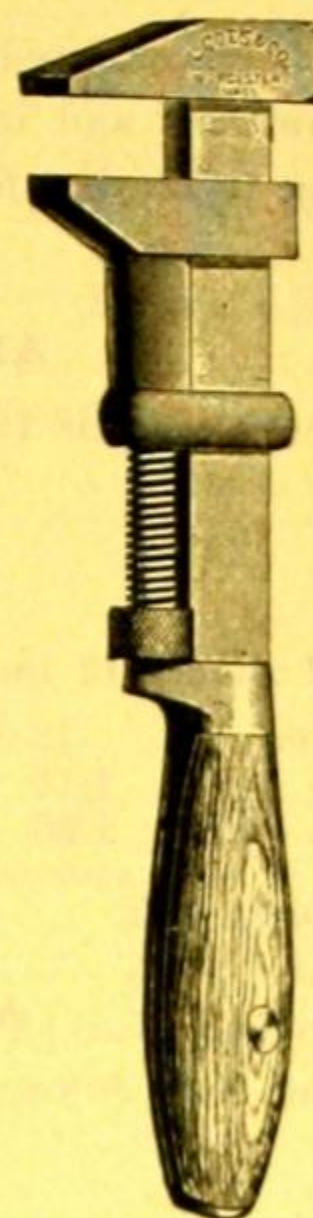
For WIRE TABLES see page 531.



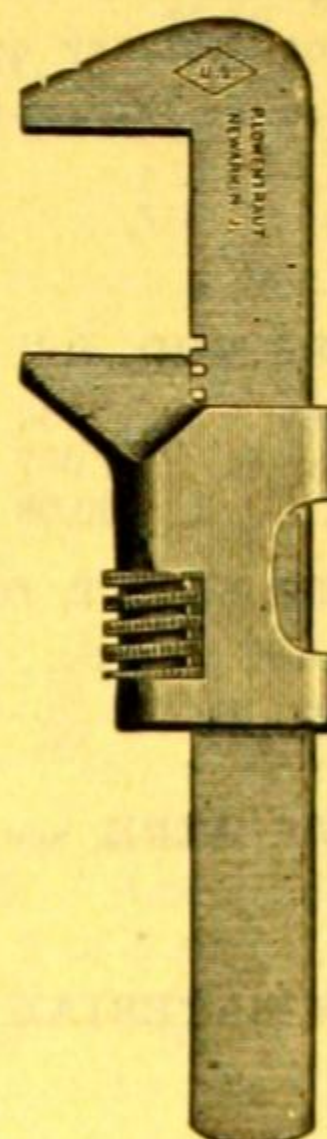
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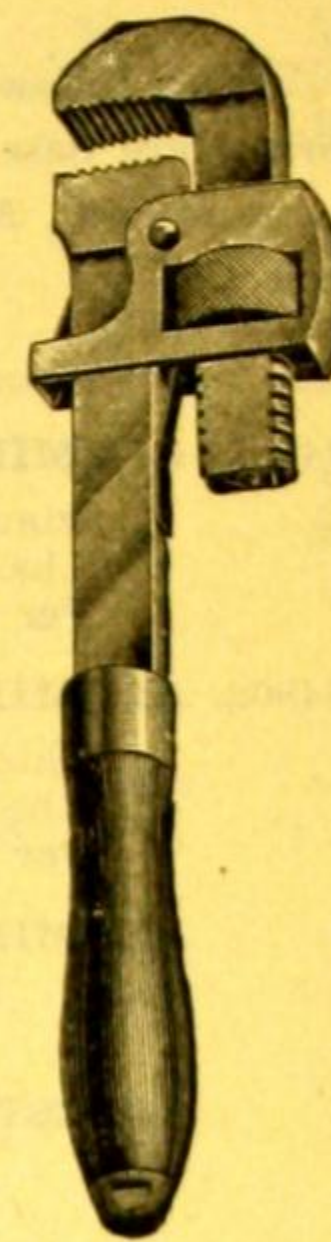
No. 14522.



No. 14544.



No. 14546.



No. 14548.

14494. **WIRE, Tinsel, Conducting Cord.** One conductor. Tinsel wire covered with green braid. Very flexible. Per yard \$0.10

14504. **WIRE, Zinc, diameter $\frac{1}{8}$ inch.** Per foot .15

For **WIRE TABLES**, see page 531.

WIRE GAGES, see **Gages**.

14510. **WIRE GAUZE, Brass, Mesh.**

	10	20	40	60	80	100	200
Per square foot	.70	.75	1.00	1.15	1.45	2.25	6.00

14512. **WIRE GAUZE, Brass, 20 mesh, in squares for use under dishes, beakers, etc.**

No.	A	B	C	F
Size, inches	4x4	5x5	6x6	12x12
Each	.10	.15	.20	.65

10% discount in lots of 10; 20% discount in lots of 100.

14516. **WIRE GAUZE, Copper, for combustion. Mesh.**

	20	40	60	80	100
Per square foot	.75	1.00	1.15	1.45	2.00

14520. **WIRE GAUZE, Iron, 20 mesh, in squares for use under dishes, beakers, etc.**

No.	A	B	C	F
Size, inches	4x4	5x5	6x6	12x12
Each	.05	.06	.08	.30

10% discount in lots of 10; 20% discount in lots of 100.

14522. **WIRE GAUZE, Tinned Iron, with flat asbestos center $3\frac{1}{2}$ inches in diameter, in squares for use under dishes, beakers, etc.**

No.	A	B	C
Size, inches	4x4	5x5	6x6
Each	.10	.12	.15

10% discount in lots of 10; 20% discount in lots of 100.

14526. **WIRE GAUZE, Chromel, 16 mesh, will last almost indefinitely as the wire is practically rust-proof, and has an extremely high melting point, about 1500° C. (2800° F.).**

No.	A	B	C	F
Size, inches	4x4	5x5	6x6	12x12
Each	.30	.45	.65	2.60

10% discount in lots of 10; 20% discount in lots of 100.

14534. **WORK BENCH.** This bench is 50 inches long, exclusive of tail vise, or 56 inches over all. It is 32 inches high and 20 inches wide, with a 13 inch glued up maple top $1\frac{3}{4}$ inches thick and a 7 inch well for tools. It has holes for stops, and three spring wood stops are supplied. It is fitted with both front and tail vises, each having $1\frac{1}{2}$ -inch patent saw-cut threaded bench screws. Bench is fitted with both back board and tool rack, as shown in illustration. Weight packed for shipment, 120 pounds. **F. O. B. Factory** 20.00

14544. **WRENCH, Monkey, good quality. Length, 8 inches** .90

14546. **WRENCH, Monkey, Pocket, $5\frac{1}{2}$ inches long** .45

14548. **WRENCH, Stillson's Pipe. 10 inches long, will take pipe from $\frac{1}{8}$ inch to 1 inch.** 1.75

RAW MATERIAL

The following material has been selected with special reference to the laboratory shop. The prices are based on ordinary quantities and include cost of cutting. Special prices will be quoted on large orders. All prices are subject to market fluctuations. Castings in all metals supplied at market prices.

ALUMINUM

14800. **ALUMINUM ROD**, full lengths 8 to 10 feet. (See note below.)

Diam., in.	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
Lbs. per ft.	.057	.089	.128	.227	.356	.516	.697	.911
Per ft.	\$0.08	.12	.18	.25	.50	.65	.90	1.15

14802. **ALUMINUM SHEET**, full sheets 12 inches wide, 5 to 6 feet long. (See note below.)

Thickness, B. & S. No.	8	12	14	16	18	20	22	24	26	28	30	36
Lbs. per sq. ft.	1.8	1.13	.89	.71	.56	.45	.36	.28	.23	.18	.14	.075
Per sq. ft.	1.90	1.20	.95	.75	.60	.50	.45	.40	.35	.30	.25	.25

ALUMINUM WIRE, see page 525.

ASBESTOS

ASBESTOS MATERIAL, see Nos. 308 to 326.

BRASS

14830. **BRASS ROD**, Round, full lengths 12 feet. (See note below.)

Diam., inches.	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
Lbs., per ft.	.045	.100	.18	.28	.40	.55	.72	1.13	1.63	2.21	2.89
Per ft.	.05	.05	.10	.15	.20	.25	.35	.50	.75	1.00	3.00

14832. **BRASS ROD**, Square, full lengths 10 to 12 feet. (See note below.)

Size, inches	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$
Lbs., per ft.	.23	.51	.92
Per ft.	.15	.30	.45

14834. **BRASS SHEET**, full sheets 12 inches wide, about 6 feet long. (See note below.)

Thickness, B. & S. No.	8	10	12	14	16	18	20	22	24	26	28	30
Lbs., per sq. ft.	5.69	4.51	3.57	2.83	2.25	1.78	1.41	1.12	.89	.70	.55	.44
Per sq. ft.	3.00	2.25	1.80	1.50	1.15	1.00	.75	.60	.50	.45	.35	.30

14836. **BRASS STRIP**, full lengths 10 to 12 feet. (See note below.)

Size, inches	$\frac{1}{16} \times \frac{1}{2}$	$\frac{1}{8} \times \frac{1}{2}$	$\frac{1}{8} \times \frac{5}{8}$
Lbs. per ft.	.115	.23	.29
Per ft.	.10	.15	.20

14838. **BRASS TUBING**, full lengths 12 feet. (See note below.)

Diam., outside, in.	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
Wall } No. 14..Per ft.	..	..	..	..	..	.30	.35	.40	.45	.50	.70	.75	1.00	1.10
B. & S. } No. 18..Per ft.	..	..	.15	.15	.15	.15	.20	.25	.30	.35	.45	.50	.55	.65
Gage. } No. 20..Per ft.	.10	.10	.10	.10	..	..	..	..	..	..	..	..	..	..

BRASS WIRE, $\frac{1}{16}$ inch and smaller, see page 525

CARBON

14840. **CARBON**, Granulated, for experimental purposesPer lb. .25

14842. **CARBON RODS**, plain, 12 inches long.

Diameter, inches	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$
Each	.18	.18	.18	.26

14844. **CARBON SHEET**, 12x12 inches.

Thickness, inches	$\frac{1}{4}$
Per sheet	3.00

Special sizes, cut to order, quoted on application.

CARBONS, for batteries, see general heading **Batteries**.

Note.—For convenience in shipping, certain items—rods, tubing, etc.—are cut in about 3-foot lengths, unless specially ordered in longer pieces.

COPPER

14848. COPPER ROD , full lengths 10 to 12 feet. (See note below.)								
Diam., inches	1/4	3/8	1/2					
Lbs. per ft.	.189	.426	.757					
Per ft.	\$0.15	.25	.45					
14850. COPPER SHEET , plain, full sheets 12x60 inches. (See note below.)								
Thickness, B. & S. No. 14 16 18 20 22 24 26 28 30								
Lbs. per sq. ft. 2.90 2.30 1.83 1.45 1.15 .91 .72 .57 .46								
Per sq. ft. 2.00 1.50 1.25 1.00 .80 .75 .60 .55 .50								
14852. COPPER SHEET , Foil. B. & S. No. 36.....								
							Per square foot	.25
14854. COPPER TUBING , 1/8 inch wall. (See note below.)								
Diameter, outside, inches.....	1/4	3/8	1/2					
Per foot	.15	.20	.25					

COPPER WIRE, see page 525.

FIBER

14862. FIBER ROD , black, full lengths about 30 inches.								
Diameter, inches	1/4	5/16	3/8	1/2	5/8	3/4	1	
Per foot	.25	.30	.30	.45	.55	.85	1.75	
14864. FIBER SHEET , black, full sheets about 24x34 inches.								
Thickness, inches	1/8	3/16	1/4	5/16	3/8	1/2		
Per sq. ft.	.95	1.35	1.80	2.40	3.25	4.00		
14866. FIBER TUBING , black, thickness of wall 1/8 inch; full lengths 2 to 3 feet.								
Diameter, inside, inches.....	1/4	3/8	1/2	5/8	3/4	1		
Per foot	.25	.30	.35	.40	.45	.55		

IRON

14870. IRON ROD , soft, for electro-magnets. (See note below.)								
Diameter, inches	1/4	3/8	1/2					
Lbs. per ft.	.16	.37	.67					
Per ft.	.10	.15	.25					
14872. IRON SHEET , Tinned. Common tin plate, size 20x28 inches.								
No.	1C	X	XX	XXX				
Approx. thickness, B. & S. No.	28	26	25	24				
Per sheet	.35	.40	.45	.50				
14874. IRON SHEET , American Russia, approximate thickness, 0.016 inch.....							Per sq. ft.	.15
IRON WIRE , see Steel Wire, page 526.								

LEAD

14880. LEAD SHEET .								
Thickness, inches	1/4	3/8	1/2	5/8	3/4	1		
Lbs. per sq. ft.	1	2	4	8	12	16		
Per sq. ft.	.45	.50	1.15	2.25	3.25	4.50		
LEAD SHOT , see No. 8216.								
14882. LEAD TUBING , medium wall.								
Diameter, inside, inches							1/4	
Lbs. per ft.							.375	
Per ft.							.12	

LEAD WIRE, see page 526.

MICA

14888. MICA SHEET .								
Size, inches	2x4 1/2	4x5	4x6	5x7				
Per sheet	.10	.20	.25	.50				

NICKEL

14890. NICKEL SHEET , pure, for chemical work, 12 inches wide.								
Thickness, B. & S. Gage No.						18	22	
Per sq. ft.						5.75	3.75	

PHOSPHOR BRONZE

PHOSPHOR BRONZE RIBBON , for galvanometer suspensions, see page 193.								
14894. PHOSPHOR BRONZE SHEET , full sheets 6 inches wide and 4 to 6 feet long. (See note below.)								
Thickness, B. & S. No.	22	24	26	30				
Per sq. ft.	2.10	1.75	1.45	1.00				

PLATINUM

PLATINUM SHEET AND WIRE, see general heading Platinum Ware.

NOTE: For convenience in shipping, certain items—rods, tubing, etc.—are cut in about 3-foot lengths, unless specially ordered in longer pieces.

RUBBER

14900. RUBBER ROD, hard, polished, full lengths 30 inches.

Diam., inches	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
Lbs. per ft.	.027	.04	.063	.10	.16	.23	.29	.42
Per ft.	\$0.15	.25	.30	.40	.55	1.10	1.45	2.00

14902. RUBBER SHEET, hard, polished, full sheets 20x48 inches.

Thickness, inches	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$
Lbs. per sq. ft.	.38	.76	1.14	1.52
Per sq. ft.	1.40	2.75	4.00	5.00

RUBBER SHEET, soft, see page 434.

RUBBER TUBING, soft, see general heading Rubber Tubing.

STEEL

STEEL WIRE, see page 526.

14906. STEEL ROD, Cold Rolled, Rectangular, full lengths 10 to 12 feet. (See note below.)

Size, inches	$\frac{1}{16} \times \frac{1}{2}$	$\frac{1}{8} \times \frac{1}{2}$	$\frac{1}{4} \times 1$
Lbs. per ft.	.106	.212	.85
Per ft.	.05	.10	.20

14907. STEEL ROD, Cold Rolled, Round, full lengths 10 to 12 feet. (See note below.)

Diameter, inches	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
Lbs. per ft.	.17	.27	.39	.67	1.1	1.5	2.1	2.7
Per ft.	.05	.05	.07	.10	.15	.20	.30	.35

14910. STEEL ROD, Coppered Bessemer, round. (See note below.)

Diameter, inches	$\frac{3}{8}$	$\frac{1}{2}$
Lbs. per ft.	.39	.67
Per ft.	.08	.15

14914. STEEL ROD, Magnet, Round.

Diameter, inches	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$
Per ft.	.25	.45	.75	1.60

14915. STEEL ROD, Magnet, Square.

Size, inches	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$
Per ft.	.30	.60	1.00	2.00

Hardening and magnetizing quoted upon application.

TIN

TIN SHEET, see Iron Sheet, tinned.

14930. TIN SHEET, pure block tin, B. & S. No. 20, 12 inches wide Per sq. ft. 2.00

14932. TIN TUBING. Pure block tin.

Diameter, inside, inches	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$
Ounces per foot	4	5	6	8	8
Per ft.	.30	.40	.45	.60	.60

ZINC

14940. ZINC SHEET, thin, B. & S. No. 32 Per sq. ft. .15

14942. ZINC SHEET.

Thickness, inches	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$
Lbs. per sq. ft.	1.15	2.30	4.60
Per sq. ft.	.35	.75	1.40

ZINC WIRE, see page 527.

NOTE: For convenience in shipping, certain items—rods, tubing, etc.—are cut in about 3-foot lengths, unless specially ordered in longer pieces.

APPROXIMATE FEET PER POUND OF WIRE.

Also Approximate Resistance of Copper and German Silver Wire.

B. & S. No.	Aluminum Wire.	Brass or G. S. Wire.	Copper Wire.			Iron or Steel Wire.	Ohms per foot.	
			Bare.	D. C. C.	D. S. C.		Copper.	18% G. S.
14	268	85	80	.....	.....	88	.00252	.0460
15	334	107	102	.....	.....	108	.00318	.0580
16	417	132	128	.....	.....	139	.00401	.0732
17	526	171	162	.....	.....	178	.00506	.0923
18	667	215	204	.....	.....	226	.00637	.1164
19	847	272	264	.....	.....	279	.00804	.1467
20	1,063	343	324	298	312	353	.01014	.1850
21	1,346	431	408	370	389	446	.01278	.2333
22	1,695	549	515	461	493	565	.01612	.2941
23	2,123	684	650	584	631	714	.02032	.3710
24	2,680	869	819	745	779	909	.02563	.4678
25	3,389	1,086	1,033	903	966	1,124	.03231	.5899
26	4,291	1,388	1,302	1,118	1,202	1,428	.04075	.7438
27	5,405	1,754	1,642	1,422	1,542	2,000	.05138	.9386
28	6,849	2,222	2,071	1,759	1,917	2,273	.06479	1.183
29	8,620	2,777	2,611	2,207	2,485	2,857	.08170	1.491
30	10,869	3,448	3,294	2,534	2,909	3,623	.1030	1.879
31	.....	4,347	4,152	2,768	3,683	4,566	.1299	2.371
32	.....	5,555	5,236	3,737	4,654	5,649	.1638	2.990
33	.....	7,142	6,602	4,697	5,689	7,194	.2066	3.771
34	.....	9,090	8,328	6,168	7,111	9,090	.2605	4.756
35	.....	11,111	10,501	6,737	8,534	11,493	.3284	5.997
36	.....	14,084	13,238	7,877	10,039	14,493	.4142	7.560
37	.....	.....	16,691	9,309	10,666	.....	.5222	9.532
38	.....	.....	20,854	10,666	14,222	.....	.6585	12.02
39	.....	.....	26,302	11,907	16,516	.....	.8304	15.16
40	.....	.....	33,176	14,222	21,333	.....	1.047	19.11

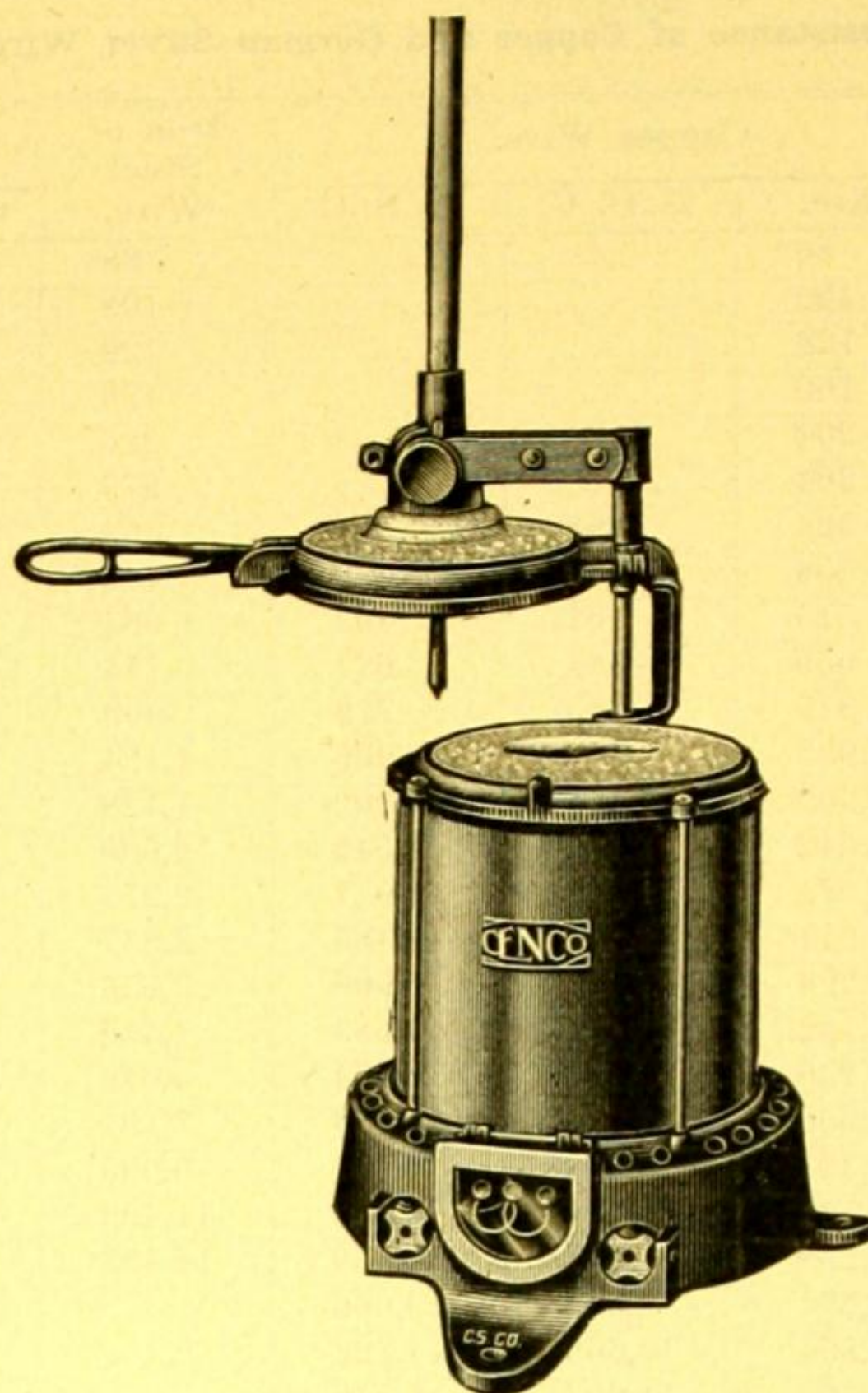
WIRE GAGE TABLE.

Showing sizes in decimal parts of an inch.

Wire Gage Number.	American or Brown & Sharpe.	Washburn & Moen Mfg. Co.	Music Wire.	Wire Gage Number.	American or Brown & Sharpe.	Washburn & Moen Mfg. Co.	Music Wire.
00	.365	.331	.0087	18	.0403	.047	.040
0	.325	.307	.0093	19	.0359	.041	.042
1	.289	.283	.0098	20	.0320	.035	.043
2	.258	.263	.0105	21	.0285	.032	.045
3	.229	.244	.0115	22	.0253	.028	.047
4	.204	.225	.0125	23	.0226	.025	.049
5	.182	.207	.0145	24	.0201	.023	.053
6	.162	.192	.0150	25	.0179	.020	.056
7	.144	.177	.0175	26	.0159	.018	.061
8	.128	.162	.0190	27	.0142	.017	.064
9	.114	.148	.0220	28	.0126	.016	.069
10	.102	.135	.0245	29	.0113	.015	.072
11	.091	.120	.0270	30	.0100	.014	.076
12	.081	.105	.0285	31	.0089	.0135	.081
13	.072	.092	.0305	32	.0080	.013	.086
14	.064	.080	.0320	34	.0063	.010	.101
15	.057	.072	.0350	36	.0050	.009	.118
16	.051	.063	.0360	38	.0040	.008	.130
17	.045	.054	.0380	40	.0031	.007	.175

Fractional Equivalents in Decimals.

Fractional parts of an inch.....	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	$\frac{1}{64}$
Decimal parts of an inch.....	.5	.438	.375	.313	.25	.188	.125	.063	.031	.016



No. 6428.

6428. **FURNACE, Cenco High Temperature Electric Arc**, for use in experimental work requiring the production of temperatures up to 1600° or 1700° C. (2900° to 3100° F.). Especially valuable in melting small quantities of metals such as iron and nickel in a non-oxidizing atmosphere.

The furnace is in the shape of a cylinder with a cone shaped cavity inside to take a No. 1 graphite crucible (see No. 3396). This cavity is molded in a refractory material which is surrounded by an effective heat insulator. The furnace is enclosed in a sheet iron case with cast base and top ring, held rigidly together by four bolts. The cover, of refractory material securely held in an iron frame, is adjustably mounted on a rod so that it may be raised and swung to one side where it is held in place.

Electric contact is made at the bottom of the graphite crucible by means of a carbon electrode, which passes up through the base of the furnace. The top carbon passes down through the cover, and may be raised and lowered by means of a thumb-screw to make contact with the material in the crucible and establish the arc. A graphite button is provided for placing on top of the material in the crucible, when a non-conducting material is to be fused. A resistance coil in the base is used in series with the arc to prevent excessive current when the carbon is in contact with the crucible. A mica window in the base enables the operator to determine from the appearance of this resistance coil when the arc is established.

Some idea of the performance of this furnace may be obtained from the fact that 12 ounces of nickel (melting point 1452° C.) have been melted in this furnace in 50 minutes and 6 ounces of copper (melting point 1083° C.) in five minutes.

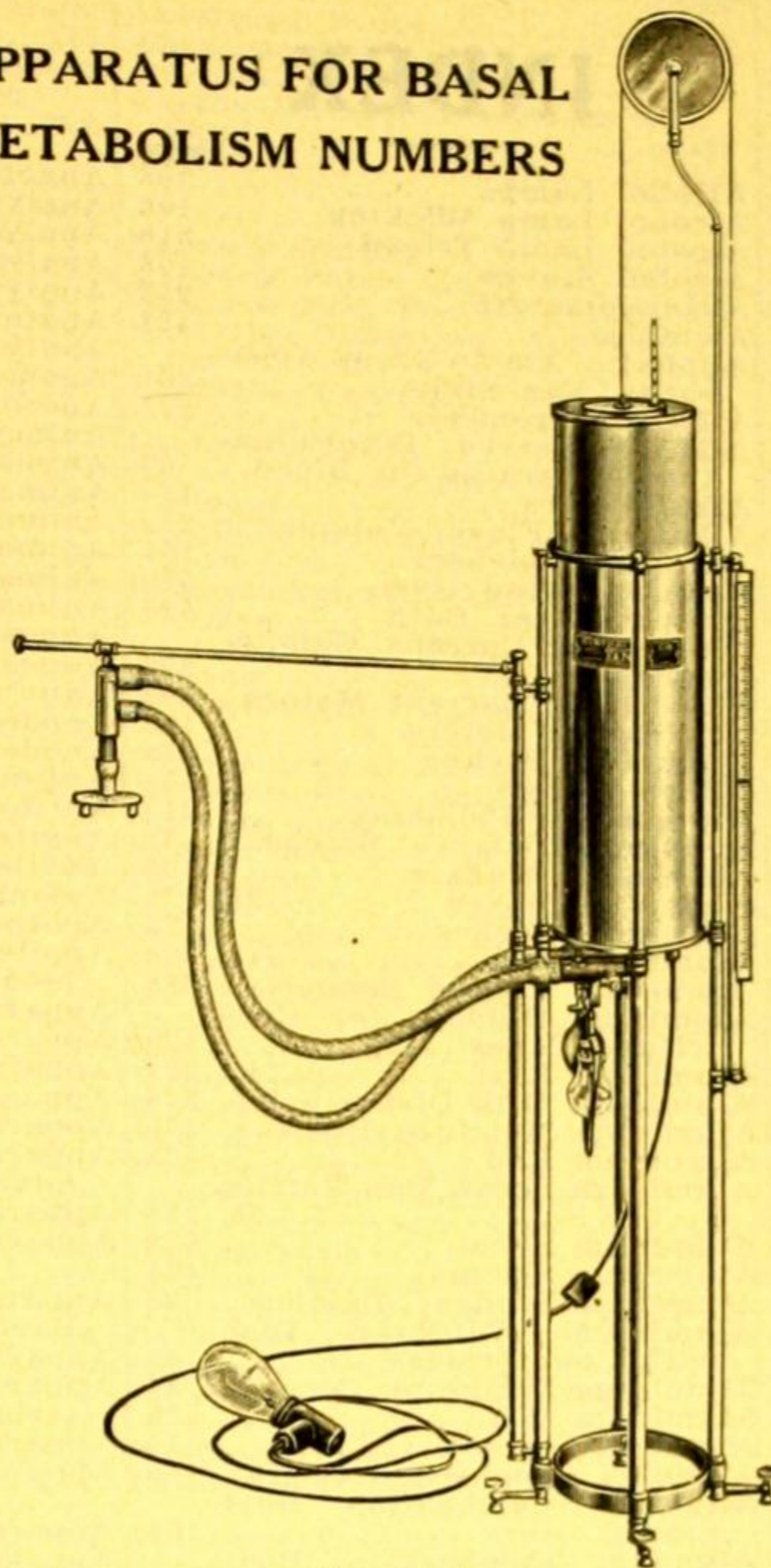
The furnace consumes 15 amperes on 110 volts, which may be increased to 30 amperes, if greater heat is desired, by a change in the connections under the base. A $\frac{3}{8}$ x 12 inch carbon constitutes the upper electrode. Binding posts are provided beneath the base for connection to the line. Special wiring is necessary on account of the large current required, and a double-pole knife switch should be included in the line for interrupting the current.

Complete as described, with 2 carbons, a No. 1 graphite crucible, and a detachable handle for lifting the cover, with complete directions for operating..... \$85.00

6429. **Extra Carbons** for No. 6428 Each .26

NOTE: Prices will be quoted on replacement parts upon request.

**APPARATUS FOR BASAL
METABOLISM NUMBERS**



No. 8420.

8420. **METABOLISM APPARATUS, Benedict Portable**, as developed at the Nutrition Laboratory, Carnegie Institution of Washington, by Dr. Francis G. Benedict and Warren E. Collins. See The Boston Medical and Surgical Journal, Vol. clxxxiii, No. 16, for Oct. 14, 1920, pages 449-448. The Benedict apparatus was designed to fill the urgent need for a satisfactory model of a readily transportable apparatus for the clinical measurement of basal metabolism numbers by determining only the amount of oxygen consumed by the patient. The oxygen consumption can be measured in 10 to 15 minutes with an accuracy equal to other standard methods of studying respiratory exchange but with the advantage that no gas analysis or weighings of any kind are required. A simple method of timing the readings of the position of the spirometer bell eliminates the use of stop-watches. The underlying principles of this apparatus were established by a number of researches which have taken place over a period of years. A particular research demonstrated that the inhalation of an oxygen-rich atmosphere does not materially modify or alter the respiratory exchange.

The apparatus consists essentially of a delicately balanced spirometer mounted in a supporting frame of telescoping tubes, which makes the apparatus more or less collapsible and facilitates transportation. To this spirometer, two rubber tubes lead from the mouth piece to enable the patient to breathe the oxygen from the spirometer bell, and to return the exhaled gases to the absorption cell through which they are forced by an electric blower mounted inside the spirometer bell. In the absorption cell all the carbon dioxide is removed. A barium hydroxide attachment, consisting of an atomizer bulb and a glass flask, is suspended from the bottom of the spirometer by two stopcocks in order to test the oxygen after it has passed through the absorption cell, on its way back to the patient for rebreathing. The absorption cell consists of a cylindrical metal chamber within the spirometer bell and is filled with coarse granules of soda lime which efficiently removes carbon dioxide from the exhaled gases. The electric blower is connected directly to this absorption chamber. It maintains a current of oxygen past the mouthpiece of 35 to 60 liters per minute, which is necessary to prevent rebreathing of the exhaled gases. The total height of the apparatus when set up for operating is slightly over 6 feet.

Complete with thermometer in threaded adapter, electric blower for either 110 volts D. C. or 60 cycles A. C., lamp resistance, connecting cord and attachment plug..... \$250.00
Soda Lime, for use with No. 8420 Metabolism Apparatus, for absorbing carbon dioxide from the exhaled gases Per pound .60
 Per 5-pound can 2.65

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